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OUR COVER: Featured on the front and back covers of this issue are the magnified scales of some of the 27 fish of the inland of N.S.W., all of which are discussed in the article on page 16.

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GOOD GRIEF, TROUT IN MANLY DAM!

by Arthur Arentz, Supervising Inspector (Inland)

N.S.W. State Fisheries is frequently asked to stock various waters in the Sydney area, so when in 1966 the Manly and Warringah District Parks Joint Committee asked us to stock Manly Dam with fish, the request was a routine one.

As trout are the only approved species at present available for stocking, the question came down to whether Manly Dam was suitable for trout. In most cases the unsuitability of waters in the Sydney area for trout can be demonstrated towards the end of the summer when water temperatures and oxygen levels are below the tolerances at which trout survive. Temperature and oxygen determinations are necessary because a deficiency in either can be lethal. For example, as the summer sun warms a body of water such as Manly Dam, a warm, therefore lighter, layer of water forms on the surface. As the summer progresses this thermal stratification becomes more pronounced and wind and wave action can be prevented from reaching the bottom cool layers of the lake. Decaying organic matter continues to sink, however, and in the course of decaying uses up the vital oxygen. It is not uncommon, therefore, to have bodies of water where the temperatures in the deeper sections are within the range of tolerance for trout but where the oxygen level is lethal.

Investigations into the project began and a departmental biologist found that while conditions in the dam were not ideal for trout, temperatures at various depths and the dissolved oxygen readings would not be lethal. In short, there was a chance trout would survive if placed in the dam.

After being advised of this the Manly and Warringah District Parks Joint Committee asked for rainbow trout to be released and 10,000 rainbow trout fry from Gaden Trout Hatchery, Jindabyne, were introduced in December, 1966.

Incidentally, the release of those fish was severely criticized by some angling organizations. Spokesmen for them said that the stocking of a Sydney reservoir was a waste of time and

money, and of fish which they thought could be introduced to better advantage elsewhere.

But that criticism was based on insufficient information and a real lack of appreciation of the role of hatcheries and of fish stocking.

So despite the criticism work went ahead, for it was considered that if there was a chance of trout surviving in the dam, it was well worth gambling with a few thousand hatchery fish.

Indeed, what better use could be made of hatchery fish than to provide a trout fishery (if only a limited one) virtually in the city of Sydney?

Further it was thought that if the experiment was successful, providing fish for Manly Dam was one of the most worthwhile uses that could be made of trout raised at either of the State's hatcheries—Gaden and the L. P. Dutton Hatchery in the New England district.

In spite of reports of "foreign" fishermen netting baskets of trout, the release of the fry in the dam was apparently unsuccessful. No reliable reports of catches were received and intensive netting carried out by departmental biologists did not yield a fish.

Because small fry were stocked in December it was possible that most of these fell victim to predators or succumbed to lethal temperature/oxygen levels during the next few months of the summer. It was therefore decided to stock larger fish, fingerlings, after the thermal stratification had broken down in the autumn and it was known for certain that temperature/oxygen levels would be favourable.

As a fingerling of 4 to 5 inches, provided with ample food, will reach pan size within 6 to 7 months, it seemed feasible that if such fingerlings were introduced in Manly Dam in autumn they would have the benefit of at least 8 to 10 months growth before the unfavourable summer conditions prevailed.

A series of regular checks was subsequently made and conditions in the dam were found to be good on 27th March, 1968. A few days later, on 3rd April, 1,000 rainbow fingerlings, measuring between $4\frac{1}{2}$ and $5\frac{1}{4}$ inches were consigned by rail from the L. P. Dutton Hatchery and were released without loss on 14th April. Minutes later they were avidly feeding.

A scale from the male rainbow trout captured in Manly Dam by Ian Schuilling. The fish was one of 10,000 released on 6th December, 1966. The centre of the scale is regenerated indicating that the original scale was probably lost while being transported from the hatchery.

The commencement of the 1967 and 1968 winter-bands are shown. The fish is therefore 2+ years old.

1. 6–12–66 *Released*
2. 1967 *Growth Check*
3. 1968 *Growth Check*
4. 13–7–69 *Captured*

Tests carried out during the 1968 winter showed they had survived and were thriving and inspection of the dam in the spring gave rise for further optimism, for trout were seen rising all around the dam.

Soon after reports of catches began coming in and some specimens of 11 inches and better were brought into us for examination.

The gamble had paid off.

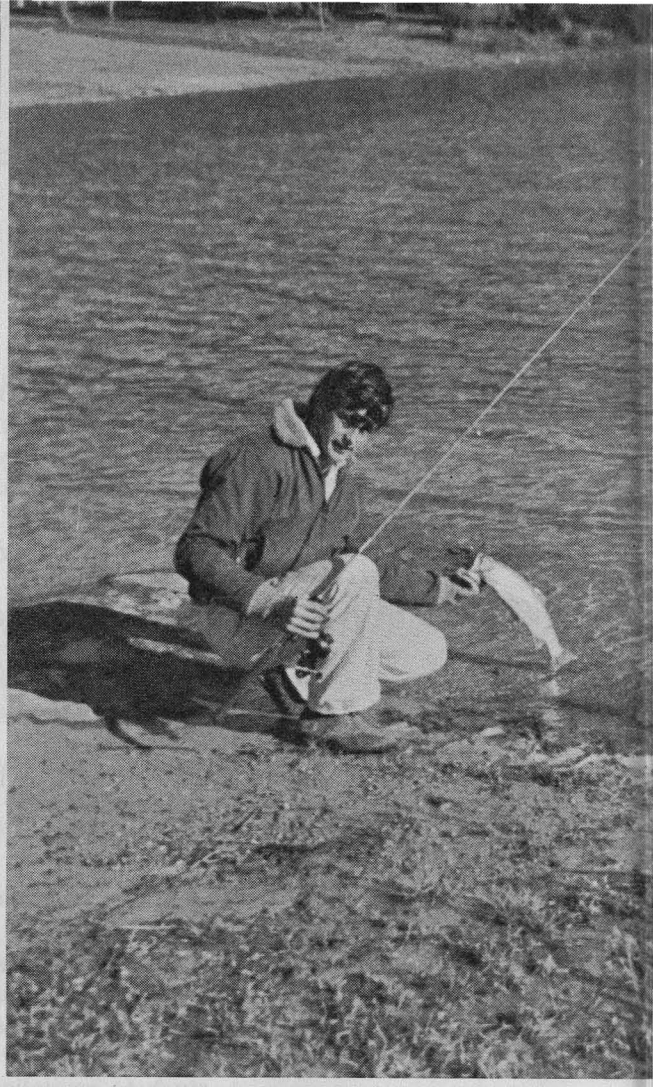
As there are no streams suitable for spawning flowing into Manly Dam it will have to be restocked each year with fingerlings from either of the State's hatcheries. But this is why a hatchery is set up—to provide stock for new fisheries and to provide stock to revitalize an existing fishery.

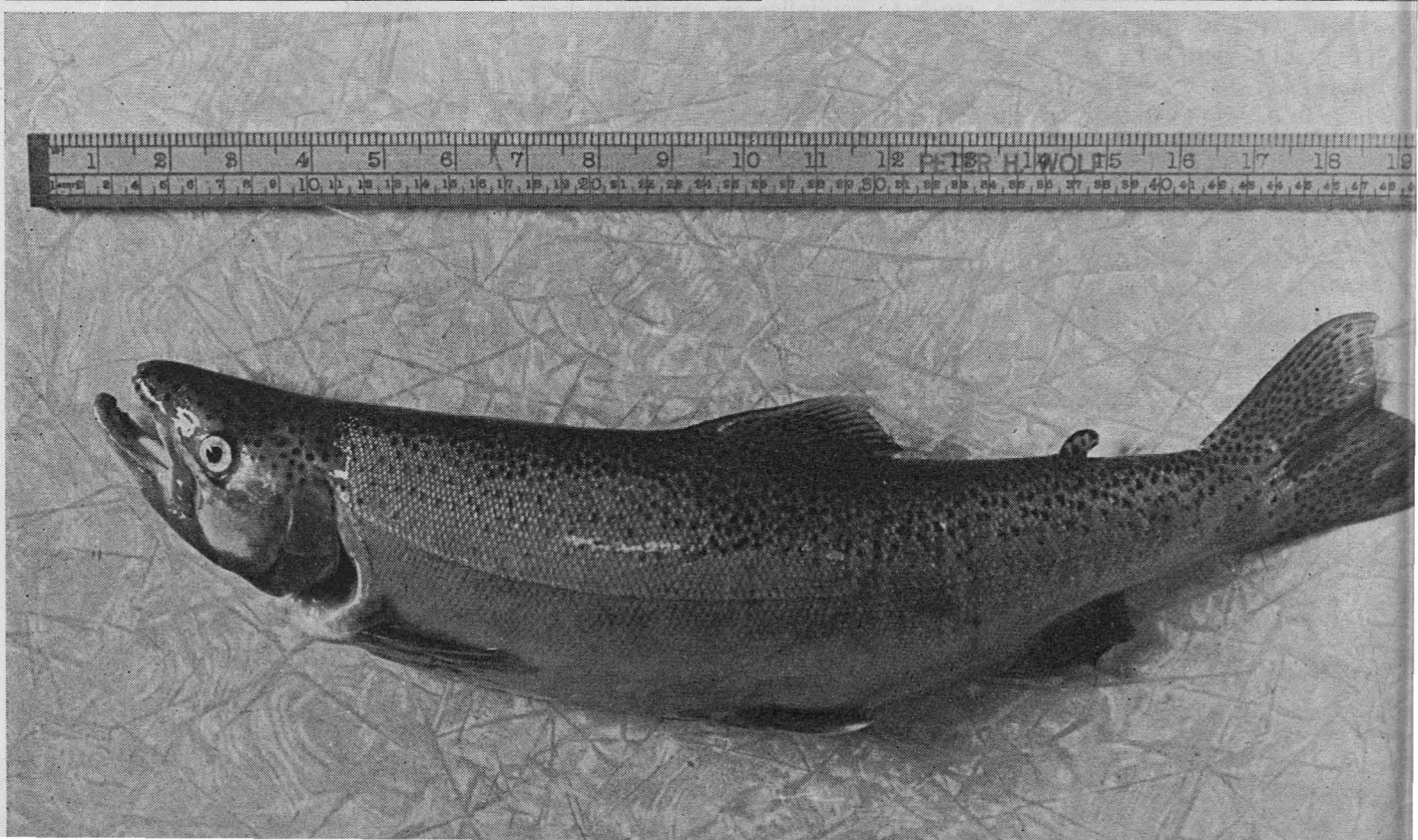
Anglers are permitted to fish for trout in the dam throughout the year as long as they hold an inland angling licence and use a rod and line with prescribed baits, e.g. artificial lures, insects and larvae thereof, or worms.

There is no size limit on trout caught in the dam, but the bag limit of 10 fish per person per day is enforced.

It is worth mentioning here that you are likely to have better luck fishing for trout in the dam in the autumn and winter months. In the very warm weather the trout will be in the deeper levels where conditions are most comfortable and in summer they show less inclination to feed. However they may rise and feed in the cool of the evenings, so give it a go in summer from dusk onwards.

State Fisheries knew that it had succeeded in providing a trout fishery in Manly Dam, but just how good was it?




PETER H. WOLF

A young angler, Mr Ian Schuilling, of Mosman, answered part of that question when he called into the office on 15th July this year and brought with him a 2 lb 12 oz rainbow which he had caught in the dam the previous Sunday.

Examination of the fish's scales (pictured) revealed that it was one of the fry from Gaden Hatchery which had been liberated in the dam back in December, 1966.

That news was, to put it mildly, very well received for it proved that at least some of those fry had survived and grown to a good size.

Ian Schuilling is a member of the *North Shore Sport Fishing Club, which was formed in April this year.

In June the club began to take an interest in the fishing provided in the dam and since then members have recorded the weight and length of all fish taken there.

Opposite left: Mr Ian Schuilling with his record catch.

At time of writing (August) Mr Schuilling's trout was a club record, but (and this was the news that was so pleasing) he and other members were regularly taking trout from the dam in June and July which weighed around 2 lb 5 oz.

Opposite right: The President of the North Shore Sport Fishing Club, Mr Jim Whittle, with a 2 lb 5 oz rainbow trout which he caught at Manly Dam on 6th July.

He also said that he had seen fishermen on the dam lose trout which he estimated to have been better than 3 lb.

Anglers will also be pleased to know that as well as Manly Dam the Wentworth Falls Lake has been stocked with 1,200 yearling rainbows.

Below: A 19 inch long, 2 lb 12 oz male rainbow trout caught in Manly Dam on 13th July by Mr Ian Schuilling, of Mosman.

This was done in August, 1968 with the assistance of the Central Acclimatisation Society. In May of this year that project also appeared to be successful for fish measuring 13 to 14 inches were being caught.

State Fisheries look on these projects with hatchery trout as gambles which have paid off and hope that by now their critics are thinking good grief, trout! Where next?

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*The North Shore Sport Fishing Club welcomes new members. Meetings are held on the first Tuesday of the month at 8 p.m. in the Leagues Room of the North Sydney Anzac Memorial Club.

"Monster" baited with morsel of bread

Well known angler and fishing writer, Mr Ron Calcutt, of Kogarah, pictured with his sportfishing and open Australian record catch of a 19 lb 14 oz black drummer (rock blackfish).

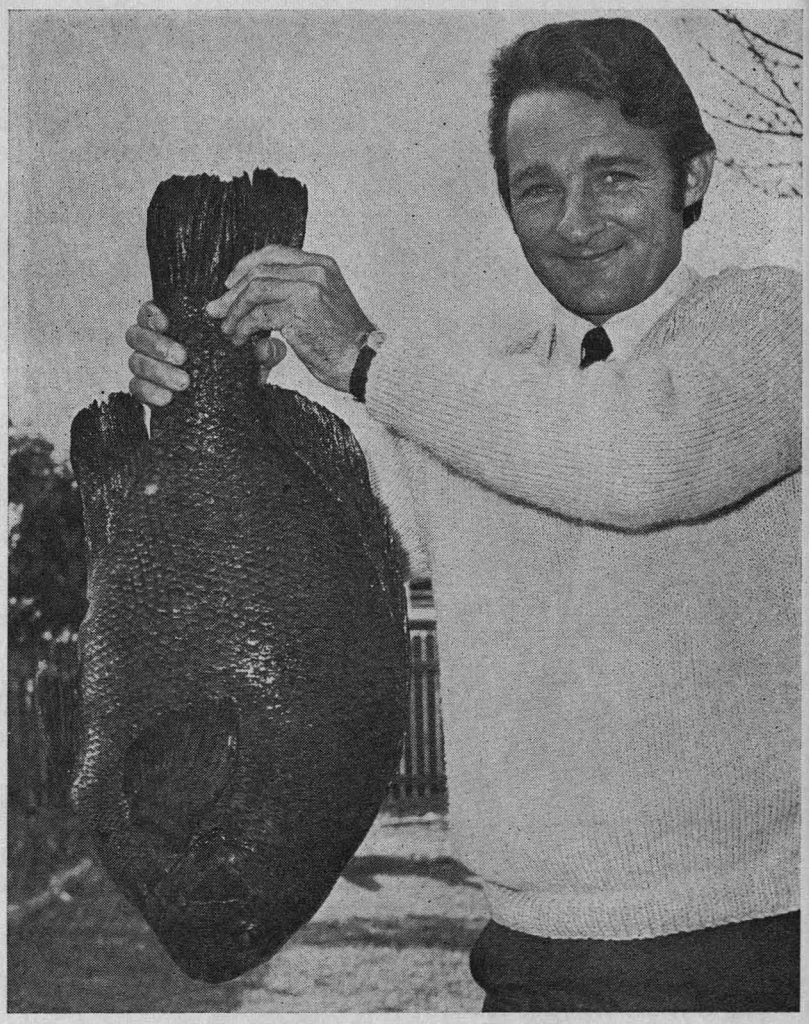
Mr Calcutt caught the fish at Jibbon (Snapper Rock) in September, and it is easily the biggest black drummer caught in Australia. He used a 15 lb line and a small piece of bread as bait.

Bread, by the way, is becoming a most popular "lure", especially with members of fishing clubs in the Illawarra area. In recent months some of the best catches from the rocks there were baited with bread.

The story of Mr Calcutt's catch has an interesting twist to it. He first hooked it on a 9 lb line, but lost it. Disappointed he switched to the heavier line, fitted with a 2/0 stainless steel hook and later in the day discovered he had caught the same, apparently very hungry fish, for when he reeled in the "monster" he found he had recovered his first hook as well!

His catch has been mounted and presented to the Australian Museum.

The previous certified record for black drummer, 15 lb 4 oz, was held by Mr J. F. Thode, of Shellharbour.



Mr Ron Calcutt with his record catch

PHOTO COURTESY OF "THE SUN"

20 lb 2 oz Brown Trout caught at Eucumbene

On 22nd July State Fisheries was informed that a Victorian angler, Mr M. Harmon, of 11 Oberon Avenue, St Albans, had caught a brown trout which weighed a record 20 lb 2 oz.

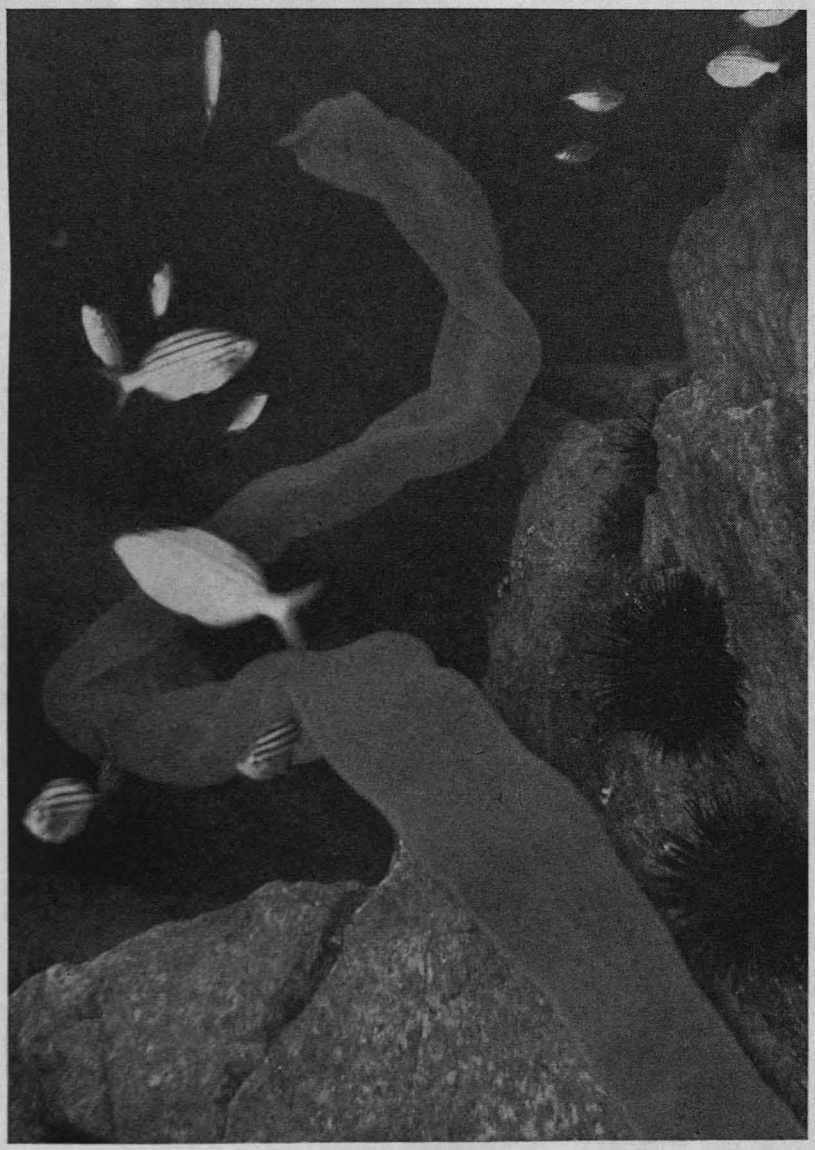
The fish, which was caught in the Providence Portal Arm of Lake Eucembene, was 36 in long and had a girth of 22½ in. It was caught on 29th May this year.

The Director of State Fisheries, Dr D. D. Francois, officially certified the catch as the N.S.W. rod-caught record for brown trout in a congratulatory letter he wrote to Mr Harmon.

"Pyrosoma" sighted in N.S.W. waters again

This snake-like creature is a pyrosoma. It was photographed off Bass Point in 1967 by a skin diver, Mr Lindsay Ditchburn, who described it as being "about 15 ft long and real eerie. A slimy, jelly-looking thing, pinkish in colour".

PHOTO COURTESY OF THE "DAILY MIRROR"



Pyrosoma were sighted again in N.S.W. waters in June and July this year and one, seen swimming on the surface, was said to have been more than 45 ft long.

There was much ado about it all in the papers and readers were told about "sea monsters" eluding capture, baffling scientists and terrifying fishermen. Yet another story was captioned "Giant blob of jelly a major discovery".

Nobody caught a pyrosoma, but one fisherman (described as being bolder than the rest) tried to net one, but it broke apart as he was hauling it aboard. However, he salvaged some pieces and sent them to Dr D. Griffin, of the Australian Museum, who has been studying the species "on and off" since the first sightings here in 1967.

Dr Griffin said he was not at all baffled by the pyrosoma. "Its characteristics are well known", he said. "What is interesting about it is that it is rare and because of this we do not know much about its life cycle. It has been sighted in several parts of the world too", he said, "first in 1873 in the South Atlantic by members of the Challenger Expedition and it is not known if it is migratory."

Need fishermen be wary of it? "No, it's harmless," said Dr Griffin, "but I suppose it would give you a fright if it happened by while you were skin diving".

Pyrosoma have been sighted both on the surface and at great depths.

Websters Dictionary describes it thus:

"Coextensive with the family pyrosomatidae of the order ascidiacea. Of chiefly tropical, free swimming, brilliantly bio-luminescent pelagic compound tunicates whose colony forms a hollow cylinder that is closed at one end and is often several feet long"—so now we know!

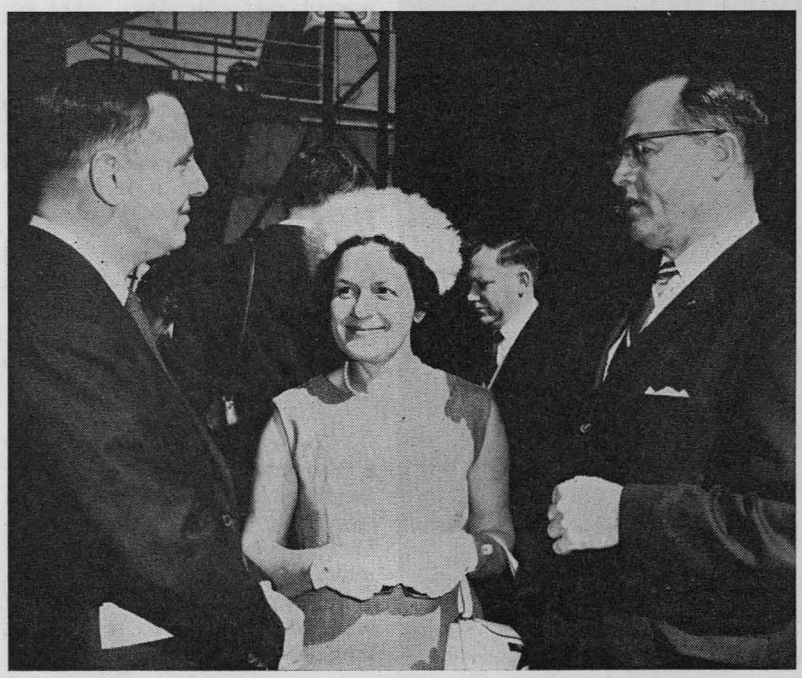
Sophisticated lady to aid the Fishi

The wife of the Chief Secretary, Mrs E. A. Willis, launched the N.S.W. State Fisheries' research vessel, Kapala, at Swan Bay near Woodburn on 11th August.

The vessel was commissioned by the State Government to enable State Fisheries' scientific staff to undertake an extensive series of research projects. These projects will be carried out for the benefit of the N.S.W. fishing industry and it is hoped that they will result in an expansion of the industry.

PHOTOS COURTESY OF THE "NORTHERN STAR"

The Chief Secretary, Mr E. A. Willis and Mrs Willis with the Director of N.S.W. State Fisheries, Dr D. D. Francois, at York Brothers shipyards after the launching. Other special guests who attended the ceremony were the M.L.A. for Richmond, Mr Bruce Duncan, the Under Secretary of the Chief Secretary's Department, Mr A. G. Kingsmill and the Chairman of the N.S.W. Fish Authority, Mr M. Joseph.



Initially the boat will be used to survey N.S.W. and adjacent waters for new prawning and fishing grounds.

The vessel was built by York Brothers of Woodburn and was designed by the naval architects Eken & Doherty.

It is 82 ft 6 in long, has a beam of 22 ft 6 in and a draft of 10 ft 3 in. Its displacement is 188 tons and it is of all welded steel construction. The vessel is fitted with the most sophisticated electronic equipment, fishing gear and refrigeration facilities available.

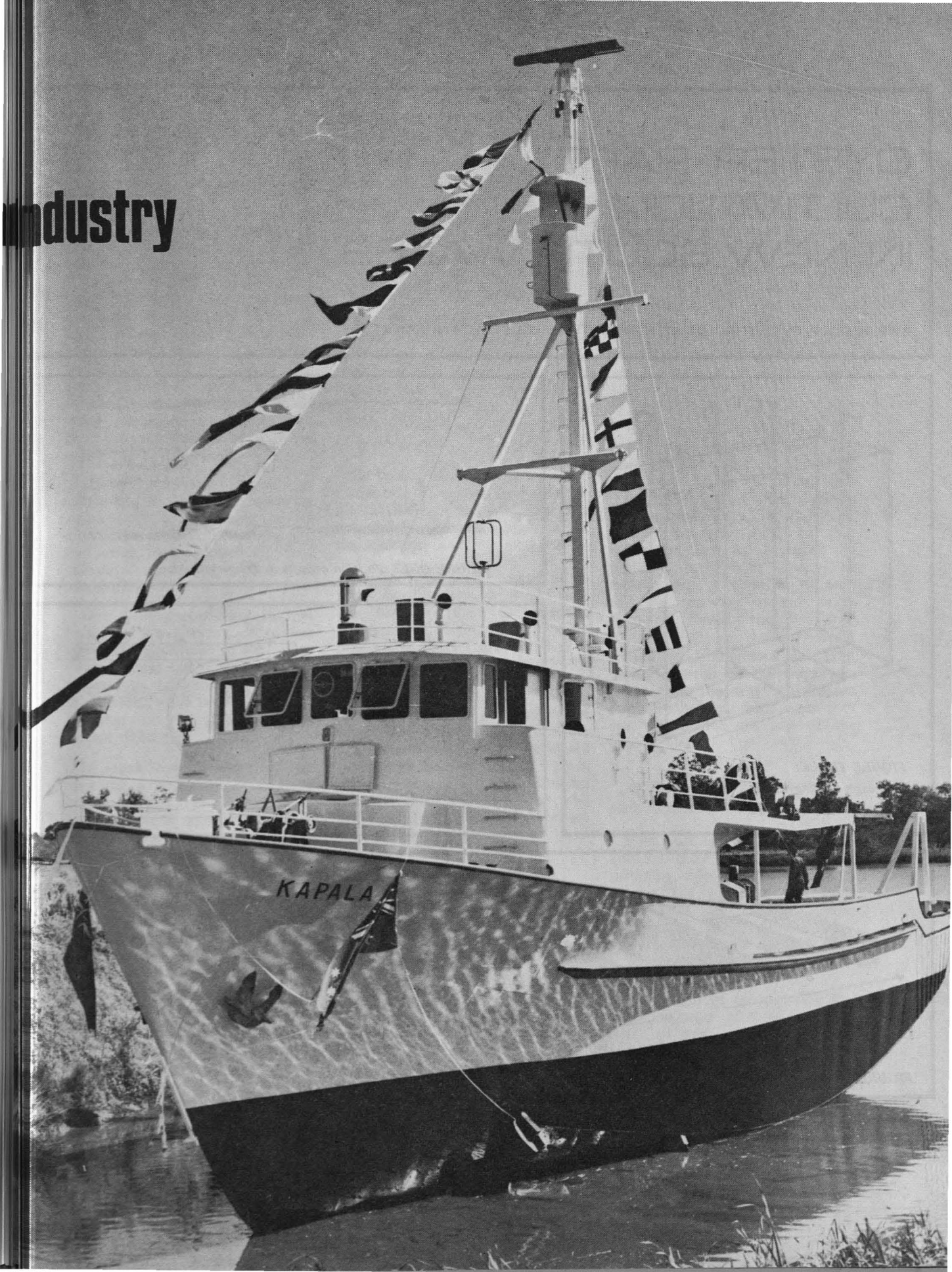
There are ten berths on board and the boat has a permanent crew of four, under the command of Captain Bruce Fitzgerald. The remaining berths are for the use of scientific staff.

Fully equipped, Kapala cost close on a quarter of a million dollars.

At present she is undergoing sea trials, but will be commissioned in Sydney shortly and will then be put to work.

An article detailing her interesting range of equipment will appear in a forthcoming issue of *The Fisherman*.

Kapala, as you probably know, is the Aboriginal word for boat.


KAPALA

OYSTER RAFT CULTIVATION IN NEW SOUTH WALES

BY P. H. WOLF, OYSTER BIOLOGIST, NEW SOUTH WALES STATE FISHERIES

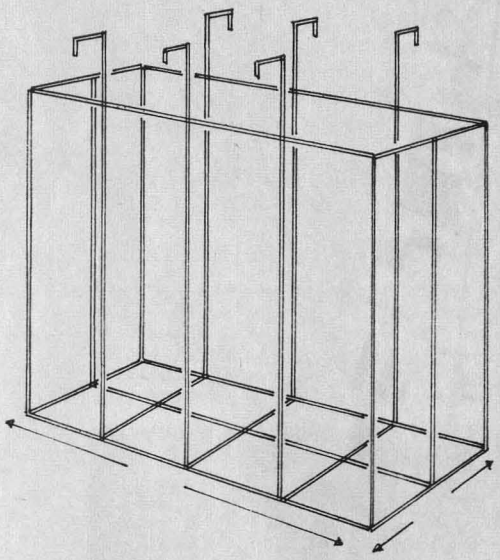


FIGURE THREE:
Iron cage, holding 13 trays, 6 ft x 3 ft ½"ϕ mild steel reinforcing rod

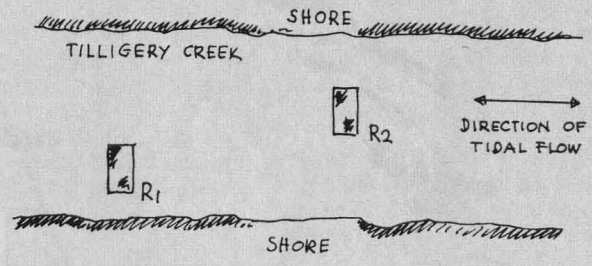


FIGURE ONE: Position of rafts in Tilligery Creek

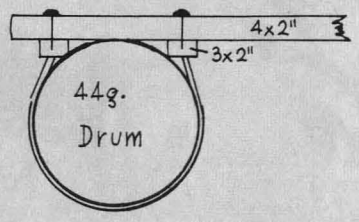


FIGURE TWO:
Detailed cross-section of drum, holding frame

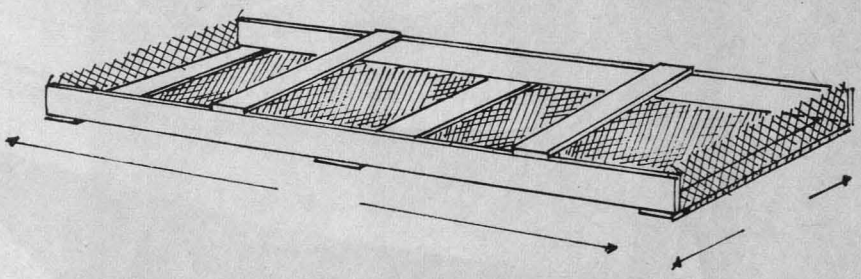


FIGURE FOUR: 3 ft x 6 ft hardwood tray with galvanized wire-mesh bottom and short sides, to allow free circulation of water

The oyster industry of N.S.W. is recognized as one of the most efficient in the world. Initially oysters were grown on stone slabs, but at present the major portion of the crop is cultured on sticks or in trays.

Rock culture is relatively inefficient, and although a high yield is obtained from sticks and trays, the latter mediums exploit only a single layer of the water column. Therefore in order to obtain a high yield, the oyster farmer must use a large area of waterway. But expansion of the industry is being restricted by a lack of suitable new areas, and the demands being placed on established and potential growing regions by urban and other developments.

Oyster production must be increased if the ever growing demand is to be met, but a significant increase in production can only be obtained if new culture techniques can be established.

One distinct possibility in that regard is the growing of oysters in ponds constructed in the rather unproductive low-lying country adjacent to many of the estuaries in N.S.W., while another is the adoption of the Japanese raft culture technique.

In Japan, oysters are grown on appropriate materials or in wire baskets suspended from rafts. That technique allows utilization of a much greater portion of the water column.

The Japanese practice has not been adopted in N.S.W. because many people considered that oysters held consistently at a depth lower than mid-tide level would be unmarketable because of damage which would be caused by the mud-worm (Polydora) and because of winter mortality.

The Sydney rock oyster is regarded as an intertidal species, but it will grow and reproduce when permanently submerged. In fact, growth is faster if the oyster is permanently submerged because the feeding time is at the maximum level.

However, the incidence of winter mortality, a disease which affects most growing areas, particularly during years of low rainfall, appears to be much higher in oysters submerged either permanently or for long periods.

But Mr Nicholas Lindeman, of Lemon Tree Passage, Port Stephens, commenced research with raft cultivation several years ago. His experiments were restricted to summer and autumn to avoid winter mortality and gave evidence of good growth.

In Japan, rafts are used for the cultivation of oysters from spat to marketable size, but Mr Lindeman has developed a combination of the stick-tray and raft methods.

He cultivates his oysters to small bottling size on sticks and then transfers them to rafts for final growth. Using this procedure first grade oysters are obtained 3 to 5 months earlier than with normal methods.

Winter mortality is an important factor for consideration, but his crops have not been seriously affected by the mud worm. This is probably due to the fast-flowing current and the fact that the bottom trays are never in contact with the river bottom.

Positioning of Rafts

Rafts have been moored in Tilligery Creek, near Lemon Tree Passage, and are anchored across the tidal flow to give the crop maximum water exchange as the tide rises and falls (see figure 1). A current velocity of approximately $4\frac{1}{2}$ knots can be reached in this area. The positioning of the rafts has been staggered to allow water, which has been filtered by the crop of one raft, to by-pass the second.

Construction of Rafts

Sixteen 44-gallon drums, fibreglassed to resist corrosion, are used to support each raft. Polystyrene foam can be used in the drums to increase their life; or plastic containers could be used to provide the necessary buoyancy.

Fixed to each bank of drums are 3 in x 2 in hardwood bearers supporting 4 in x 2 in hardwood cross pieces (see figure 2). Iron cages, (see figure 3) constructed from $\frac{1}{2}$ in diameter mild steel rod are suspended from the cross-pieces.

Each cage carries thirteen 6 ft x 3 ft trays and since each raft takes six iron cages, a total of 78 trays are supported. The trays (see figure), are different from conventional trays in that end boards are not used, so that water can flow freely across the oysters from either end. The bottom wire is bent up at each end to prevent oysters being dislodged from the trays.

Hardwood battens, 4 in x 1 in, across the top of the trays give support to the tray and ensure clearance between trays when they are placed one on top of the other.

Raft Anchoring

Each raft is equipped with six anchors, three to hold against the incoming tide and three to hold against the outgoing tide. The drum lines are orientated with the line of current flow, so that movement of water over the trays is from the open ends.

The length of the mooring line is to the order of three times the depth of water at high tide, and in Tilligery Creek, where the bottom consists of soft mud, pyramid-shaped cast concrete anchors are used.

Oyster Growth

Some of the results obtained by Mr Lindeman, using raft culture, are set out below:

Bags of second-grade oysters laid on raft	Period	Bags of first-grade oysters for market	Bags of second-grade oysters for market	Dead shell
3·6	98 days 17·12–26·3	4·0	0·25	0·5
3·9	89 days 28·12–28·3	3·5	not recorded	..
3·8	87 days 4·1–2·4	3·25	0·45	1·0
3·9	73 days 27·1–11·4	4·0	0·2	0·7
2·7	46 days 27·2–15·4	2·4	0·4	0·4
17·9	Av. 78·6 days Approx. 2½ months	17·25	1·3	2·6

These results show that during summer and autumn second-grade oysters can be transformed into first-grade in roughly two to three months.

However, Mr Lindeman offers this further information:

"I feel I should point out that the above results, while entirely accurate, refer only to this last year, which was one of our best, and it occurs to me that a more satisfactory explanation of the growth potential of this raft method might be provided by contrasting the best results from our best year with the worst results from our worst year:

Typical best results from our best year were:

2nds in	Period	1sts out	2nds out	Dead shell
3·9 bags	2·5 months	4·25 bags	0·5 bags	1·0 bags

Typical worst results from our worst year were:

3·9 bags	3·5 months	3·0 bags	0·9 bags	0·3 bags

We have observed that where the growth rate is sufficient to permit more than two cycles of production from one cage, the middle one (January to March) tends to grow more slowly than those at the beginning and end."

The growth obtained using conventional and raft supported trays cannot be accurately compared, but the growth obtained by Mr Lindeman would appear to be almost double that of oysters grown by conventional methods.

Oysters at the end of the trays appeared to grow better than those in the middle, but no difference in growth or condition was observed at different depths.

Some deaths occurred, but probably no more than usual.

Conclusions

The use of rafts to grow oysters from spat size to maturity may not be practical because of a possible high incidence of winter mortality in permanently submerged oysters. However, as a method for providing fast growth and prime condition prior to marketing, raft culture could be ideal.

Permanent immersion of the oysters during the summer months will eliminate heat killing and a method of culture whereby 78 or more trays can be matured in an area 24 ft x 7 ft in a short time is certainly worthy of considerable investigation.

Mr Lindeman's Further Comments

If our object is to provoke serious interest in this method of cultivation then it is desirable to draw proper attention to its deficiencies.

First and foremost of course, is the susceptibility to winter mortality.

Secondly, there is the difficulty of finding proper sites for these rafts.

Thirdly there is the culling problem arising from the catching and growth of organisms on the oyster shells. In our particular area we have observed that this problem seldom manifests itself in the first and second growth cycles of the year. In the third (March to May) cycle however, it invariably arises.

It may take the form of tough brown weed, of soft-shelled, but very tenacious cunjevoys, of barnacles, of mussels, or of oyster spat. Fortunately though, it has hitherto been confined to one or two of these infestations a year.

The organisms may be present in such profusion as to cover a small percentage of the oysters entirely and culling them involves the separate cleaning of each and every oyster. As you can imagine, this makes the culling much slower than for normal lease oysters.

However, we propose next year to conduct experiments with some cheap substance into which we can dip the oysters to prevent the various organisms from catching and we think that this will either solve the problem entirely or confine it within manageable limits.

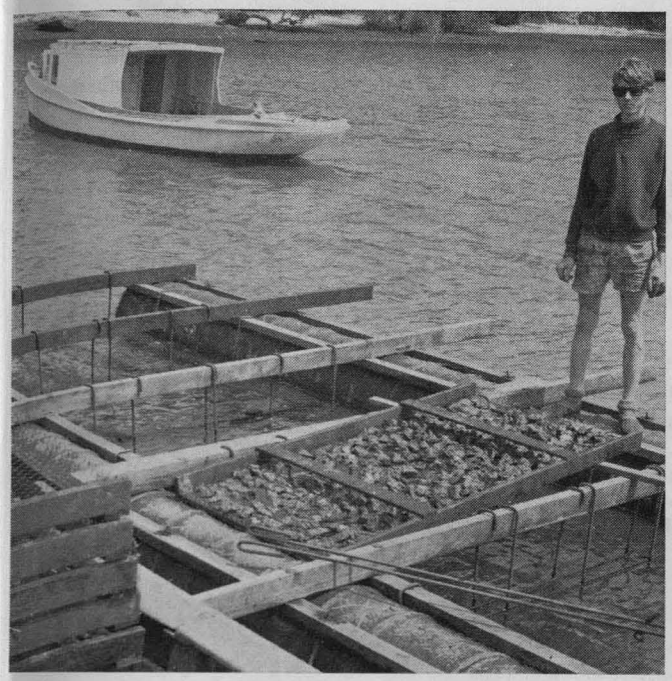


FIGURE FIVE: View of raft with suspended cages. Note open-end trays. (Photo Lindemann.)

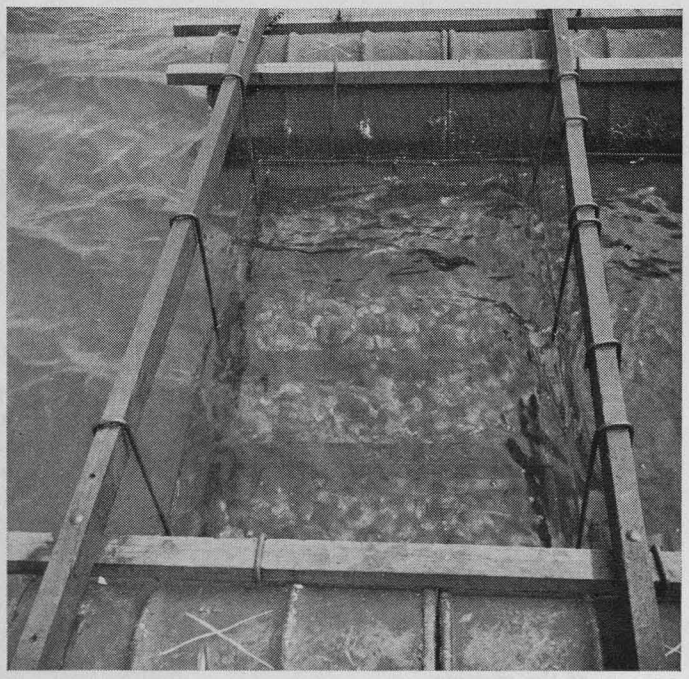


FIGURE SIX: Suspended cage with trays. Note construction of frame. (Photo Lindemann.)

FIGURE SEVEN: Moveable winch, to lift cage with trays. (Photo Lindemann.)

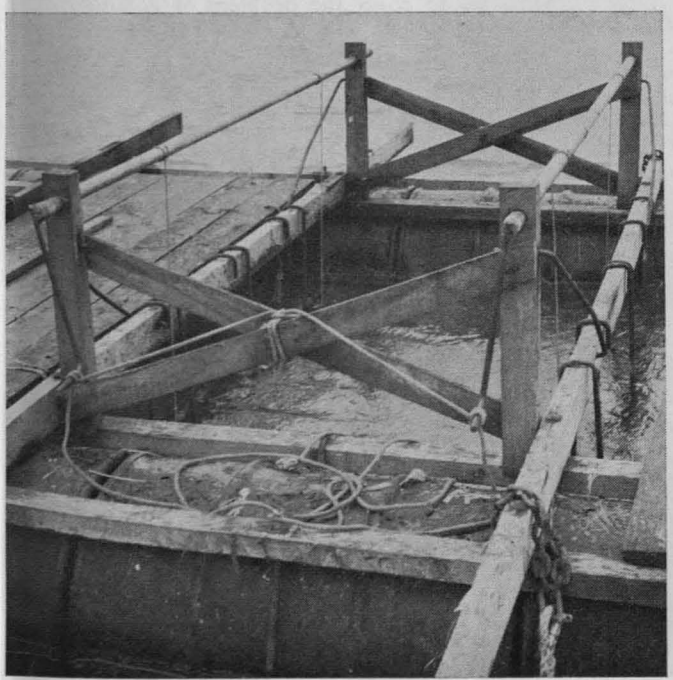
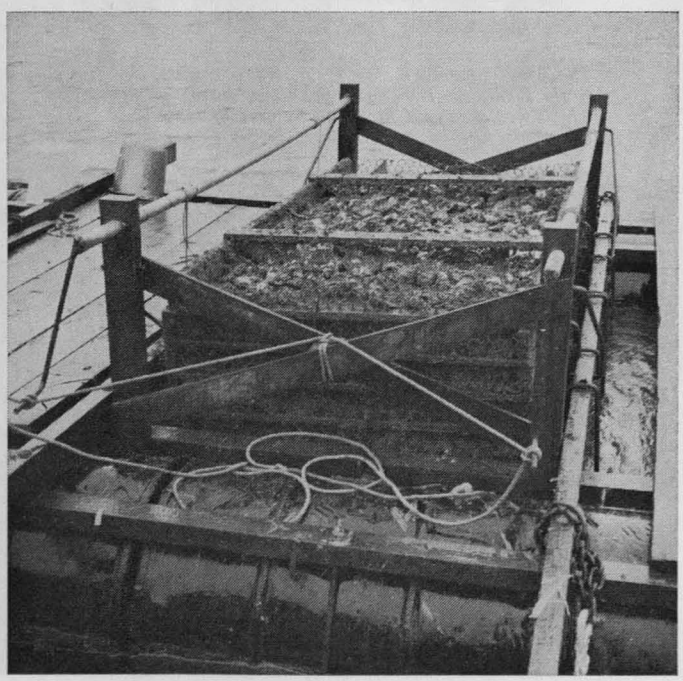


FIGURE EIGHT: Aspect of lifted battery of trays. Note open-end trays at right angles to tidal flow. (Photo Lindemann.)



Fishing Industry Conference planned for next year

"Governmental Activities in the Rational Exploitation of Australian Living Marine Resources" will be the theme of an Australia-wide conference on the fishing industry which will be held next year.

The theme was suggested by the Australian Fishing Industry Council.

Plans for the conference were announced by the Chairman of the Australian Fisheries Council. the Minister for Primary Industry, Mr J. D. Anthony, at the first meeting of this newly formed council, which was held in Darwin in June. The Chief Secretary, Mr E. A. Willis and the Director of N.S.W. State Fisheries, Dr D. D. Francois, led the N.S.W. delegation at the meeting.

These were some of the other proposals which were endorsed:

Research Trust Fund

Mr Anthony announced that a Fishing Industry Research Trust Fund had been established by the Commonwealth with an initial payment of $500,000.

Each State will set up its own fund to receive its fishing industry's contributions for research and the amount raised will be matched by a grant from the Commonwealth (see June issue of *The Fisherman*).

Reimbursement

Mr Anthony said he would examine the formula under which States were reimbursed by the Commonwealth for work performed under the Commonwealth Fisheries Act.

The review of the formula had been requested mainly because it related to the patrolling of extra territorial waters. However, Mr Anthony said he had pointed out to State Ministers that a Commonwealth inter-department committee was studying the question of the Commonwealth providing adequate patrols and that the roles of the States and the matter of reimbursement were integral parts of that study.

State Ministers asked Mr Anthony that this study proceed as a matter of urgency.

Pollution

The growing problem of pollution in the marine environment was also discussed.

Although most States have introduced legislation to protect their fishery resources within territorial waters, the council's standing committee expressed concern at the lack of suitable legislation to protect resources beyond territorial waters.

The council has therefore asked the Department of Primary Industry to urgently investigate the desirability of providing legislation under the Fisheries Act to cover the problem of pollution which will complement existing State legislation.

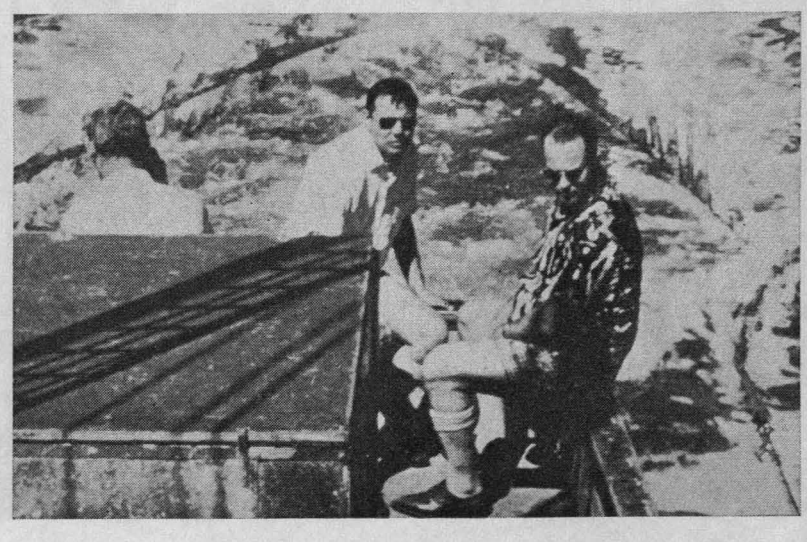
Research

A southeastern Fisheries Research Committee will be formed to study fish. There will be no limit to the number of species to be studied.

Commenting on this proposal Mr Anthony said that the new committee would study both management and research problems and that it would replace the Southern Pelagic Project Committee (which studied surface swimming fish).

The fisheries authorities of N.S.W., Victoria, Tasmania, South Australia, the Commonwealth Department of Primary Industry and the CSIRO will be represented on the committee.

The Chief Secretary, Mr E. A. Willis (right), and the Director of N.S.W. State Fisheries, Dr D. D. Francois, during an inspection cruise off Darwin, which was arranged for them as part of their visit to Darwin in June to attend the newly formed Australian Fisheries Council's inaugural meeting.



New Appointment

On 9th September the Chief Secretary, Mr E. A. Willis, approved of the appointment of Mr P. Britton to the N.S.W. Amateur Fishermen's Advisory Council. He replaces Mr F. Turner who resigned because of ill health.

Mr Britton was nominated by the N.S.W. Amateur Fishing Clubs' Association, of which he is a vice president. He is also president of the Central Coast Anglers' Association.

Mr Britton has resided at Avoca Beach for over 20 years and is conversant with N.S.W. coastal fishing. He is keen on rock fishing as well as other forms of angling.

The N.S.W. Amateur Fishermen's Advisory Council acts as a liaison body between amateur fishermen and the Chief Secretary.

Miss Carolyn Eves (centre) and **Miss Patricia Georgouras,** the N.S.W. Fishing Industry's representatives in the Miss Australia Quest, with **Chef David Koch** at the fishing industry's stand at the Sydney Boat Show.

Throughout the show fish and prawns, which had been donated by professional fishermen from all parts of the State, were cooked at the stand and handed out to show visitors as part of a campaign to promote the fishing industry.

Incidentally, this is the first year in which the industry has sponsored an entrant in the Miss Australia Quest.

Why did the fishermen enter two representatives? "Well we just couldn't decide between these two finalists, so decided to sponsor both," explained the Chairman of the N.S.W. Fish Authority, Mr Mark Joseph.

Miss Eves, 18, is a clerk at the N.S.W. Fish Authority and Miss Georgouras, 22, is a pharmacist's assistant.

FRESHW

Of the twenty-seven fish occurring in the inland only four do not have scales. Those four are:

The **freshwater catfish** (*Tandanus tandanus*).

The **flat-headed minnow** (*Galaxias planiceps*).

The **inland mountain trout** (*Galaxias bongbong*).

The **short-headed lamprey** (*Mordacia mordax*).

Fifteen of the remaining twenty-three are native fish, while the other eight are introduced species.

Scales may vary considerably in shape (see figure 1d) and size, depending on the age of the fish and the region of the body on which they occur.

Replacement scales (see figure 1b) which are formed on fish as a result of injury or growth are often quite numerous and have large featureless centres, unlike the normal scales which are covered with numerous parallel, nearly concentric lines around a usually offset focus.

Both irregular and replacement scales often lack the typical structures associated with normal scales. That is lack of spines on the exposed surface of scales, etc.

A row of lateral line scales (see figure 1a) occur laterally along approximately the mid-line of the fish between the head and tail. These have a canal running through the centre which houses the neuromast, a sensory cell associated with the lateral line system.

Only one other type of scale may be found on any one fish—ancillary scales (see figure 1c, *removed from the same fish as* 1*b and* 3*b*) which only occur on the Murray cod (*Maccullochella macquariensis*) and the trout cod (*Maccullochella mitchelli*). These are approximately one-third to one-fifth the size of the normal scale and are abundant in all specimens. The main diagnostic features between scales of different species of fish can usually be determined, even in these irregular scales.

Scales of different fish can be divided into two main groups, **ctenoid** (toothed) and **cycloid** (smooth).

Fish belonging to the same family generally have similar scales and the following descriptions are grouped according to families. In the inland of New South Wales all fish bearing ctenoid scales belong to the order PERCIFORMES (perches) which are divided into seven families, the descriptions of which follow:

There are four members in the family SERRANIDAE and the exposed surface of the scale in these is completely covered in spines (with the exception of trout cod). In most cases two-thirds or more of the scale is embedded and generally this is divided from the exposed surface (the top portion of the scales in the figures) by a line of demarcation.

Macquarie perch (*Macquaria australasica*) (see figure 2c).

Their scales are generally nearly as wide as they are long, the embedded portion of the scale being almost square. This is unlike the other three species in this group.

Golden perch (*Plectroplites ambiguus*) (see figure 2a).

Scales are rectangular in shape, particularly the embedded portion of the scale.

Murray cod (*Maccullochella macquariensis*) (see figure 3b).

The embedded portion of the scale is rectangular but generally considerably narrower than that of the golden perch. In addition to the normal ctenoid scale this species also has numerous cycloid

SCALE VARIATION IN ATER FISH OF THE INLAND OF N.S.W.

BY DR L. C. LLEWELLYN, OFFICER-IN-CHARGE,
INLAND FISHERIES RESEARCH STATION, NARRANDERA.

When an angler catches a fish he usually likes to examine its stomach contents to see what it has been feeding on. And biologists engaged in fisheries research find it helpful in many ways if they carry out a stomach contents analysis.

But unfortunately food is digested rapidly by fish and unless they are caught soon after they have been feeding, identification of their stomach contents is difficult.

However, bones and scales can generally be found in a fish's stomach and as the scales of most inland fish of N.S.W. are quite different in structure they can be used for identification purposes when necessary.

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ancillary scales which are between one-third and one-fifth the size of a normal ctenoid scale and outnumber by far the latter. They are randomly distributed among the larger scales.

Trout cod (*Maccullochella mitchelli*) (see figure 3c).

Only the scales of one specimen of trout cod have been examined. The shape of the scales in this species were identical to that of Murray cod, but it lacked any spines on the exposed surface of the scale. Instead it had a smooth irregular pattern, similar to many of the irregular and replacement scales of Murray cod. That is a cycloid or smooth scales. If this character is uniform throughout all trout cod, it is unusual to have such a closely related species as the trout cod and Murray cod with such dissimilar scales. Cycloid ancillary scales which are between one-third and one-fifth the size of a normal scale are also present. They outnumber by far the latter and are randomly distributed over the body.

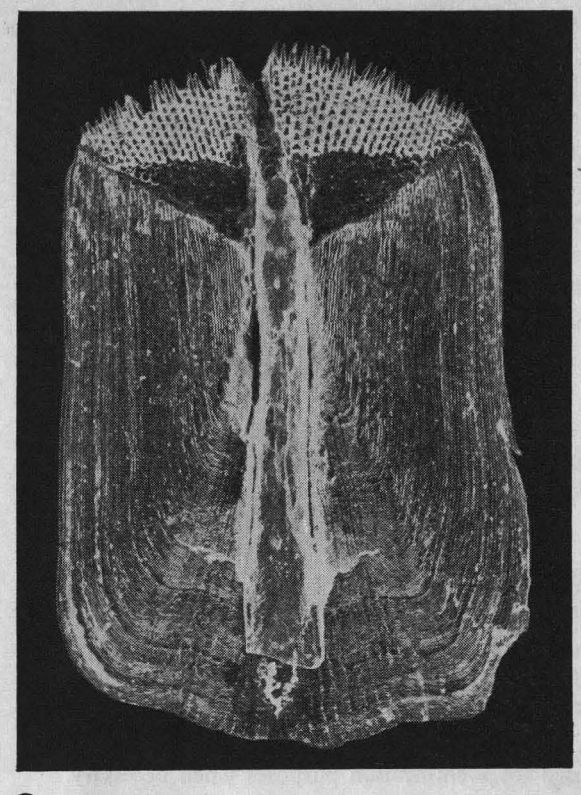
The family THERAPONIDAE is represented by two members in the inland and their scales are ctenoid, with sharp spines only occurring along the margin of the exposed portion of the scale.

Silver perch (*Bidyanus bidyanus*) (see figure 2b).

The embedded portion of the scale is rectangular. The exposed portion of the scale (top in figure) gives the appearance of possessing numerous blunt spines, but the small rectangular structures are firmly attached to the scale for their whole length.

Spangled perch (*Madigania unicolor*) (see figure 2d).

The scales of this species are generally much smaller than those of silver perch since the fish only grow to a maximum of three-quarters of a pound in weight, whereas the latter occasionally grow to 17 lb. The embedded portion of the scale is nearly square and the exposed portion appears to be covered with blunt spines which are surrounded by a nearly circular structure. However, these spines are not free and are firmly attached to the scale.



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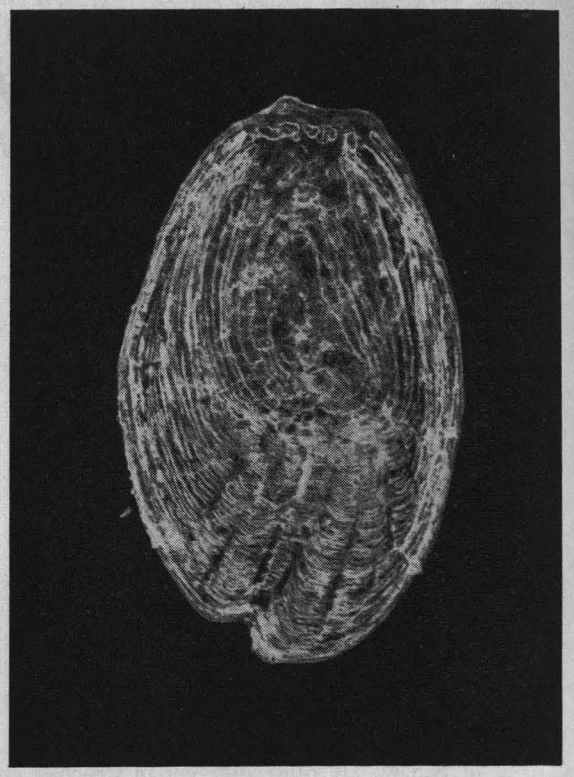

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FIGURE ONE

b

d

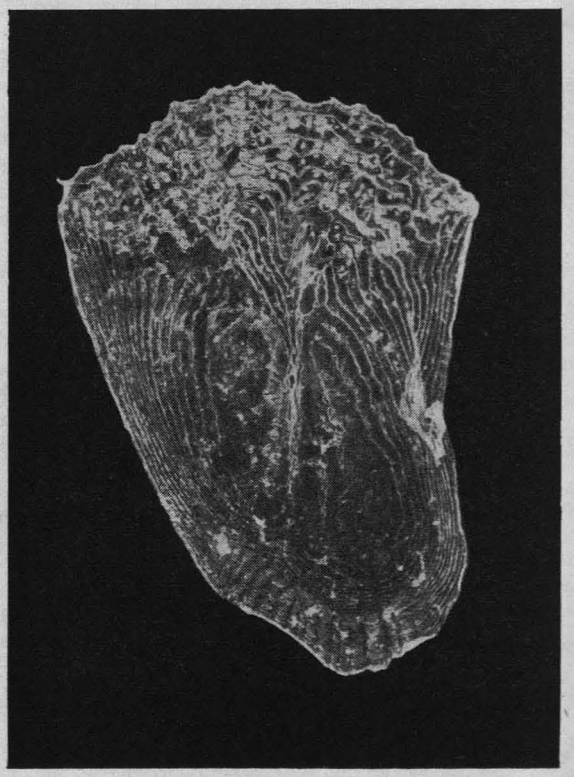

FIGURE ONE (SCALE TYPES)
(*a*) *Scale showing lateral line canal passing through it, (silver perch), magnification x* 14.
(*b*) *Replacement scale* (*Murray cod*) *x* 9.
(*c*) *Ancillary scale* (*Murray cod*) *x* 36.
(*d*) *Irregular scale x* 17.

The family KUHLIIDAE has only one member in the inland:

Southern pigmy perch (*Nannoperca australis*) (see figure 3a).

This species only grows to $2\frac{1}{2}$ inches in length and their scales are therefore always quite small. Their scales are ctenoid and give the appearance of being covered with spines over their entire exposed surface. However, only the marginal spines are true spines as the rest are affixed to the surface of the scale.

The family PERCIDAE is also only represented by one member in the inland and this fish has been introduced from European countries:

English perch (*Perca fluviatilis*) (see figure 3d).

The embedded portion of the scales of this species is different from any other in the inland due to its lobed nature. The scales are ctenoid with true spines only occurring along the exposed margin. The apparent blunt spines covering part of the rest of the exposed surface are affixed to the scale.

The family ELEOTRIDAE is represented by three species in the inland. Their scales possess a single row of spines along their exposed margin. The scales figured are all from adult fish; the flat-headed gudgeon being the largest of the three species, which grows to about 5 inches.

Western carp gudgeon (*Carassiops klunzingeri*) (see figure 4a).

The scale is oval in shape, but may have an apex along its exposed edge. The spines at the apex of the scale are generally more than half the length of spines at the end of the single row of spines.

Purple spotted gudgeon (*Mogurnda striata*) (see figure 4b).

The scales are generally more square in shape than in the western carp gudgeon and the single row of marginal spines are more uniform in length.

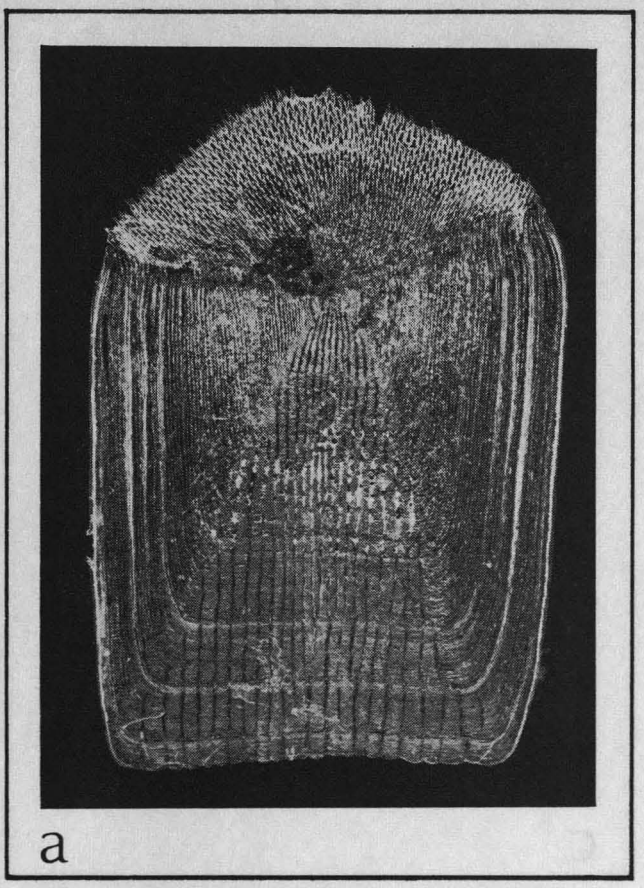

FIGURE TWO

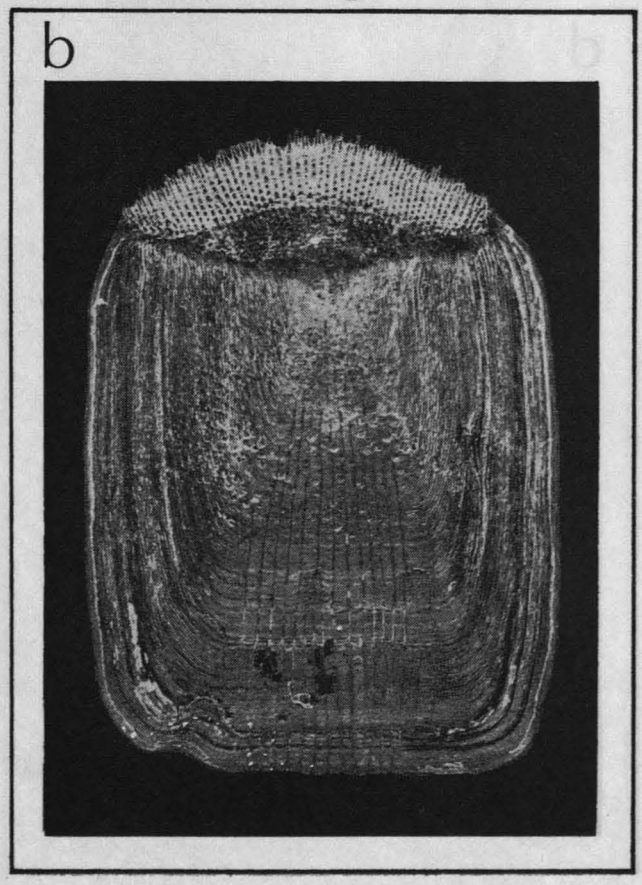

FIGURE TWO
(*a*) *Golden perch, magnification x* 9.
(*b*) *Silver perch x* 10.

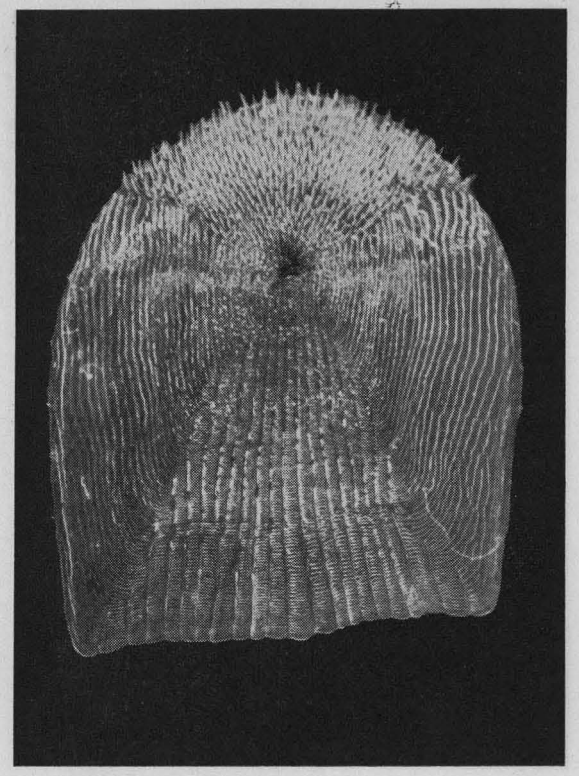

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FIGURE TWO

d

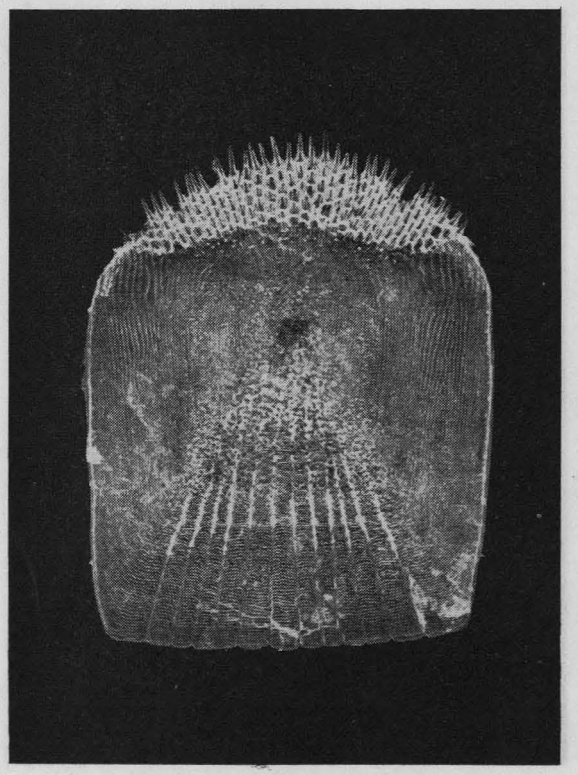

FIGURE TWO:—continued.

(*c*) *Macquarie perch x* 19.

(*d*) *Spangled perch x* 17.

The spines at the apex or its exposed edge are three-quarters to equal in length to the spines at the ends of the row.

Flat-headed gudgeon (*Philypnodon grandiceps*) (see figure 4c).

The scales are generally oval to rectangular in shape with a marked apex along its exposed edge. The spines at the apex of the scale are normally less than half the size of the spines at the ends of the row.

The abovementioned are the only species in the inland of N.S.W. possessing ctenoid scales, but there are two families in the order Perciformes which are represented in the inland which possess cycloid scales and not ctenoid scales like the other Perciformes:

The family CENTROPOMIDAE is only represented by one member—

Western chanda perch (*Ambassis castelnaui*) (see figure 7a).

The scales are small, oval shaped and they lie along the fish. That is with their transverse axis in regard to the fish longest, and with their foci situated centrally. The adult fish only grow to about 2 inches in length. The lines of flexibility are fine and they are on the embedded section of the scale. The circuli form an apex along the transverse axis which divides the embedded portion of the scale from the exposed region. The circuli are also discontinuous along the transverse periphery of the scale.

The family GADOPSIDAE is also only represented by one member—

River blackfish (*Gadopsis mamoratus*) (see figure 7c)

FIGURE THREE

(*a*) *Southern pigmy perch, magnification x* 33.

(*b*) *Murray cod x* 13.

(*c*) *Trout cod x* 13.

(*d*) *English perch x* 17.

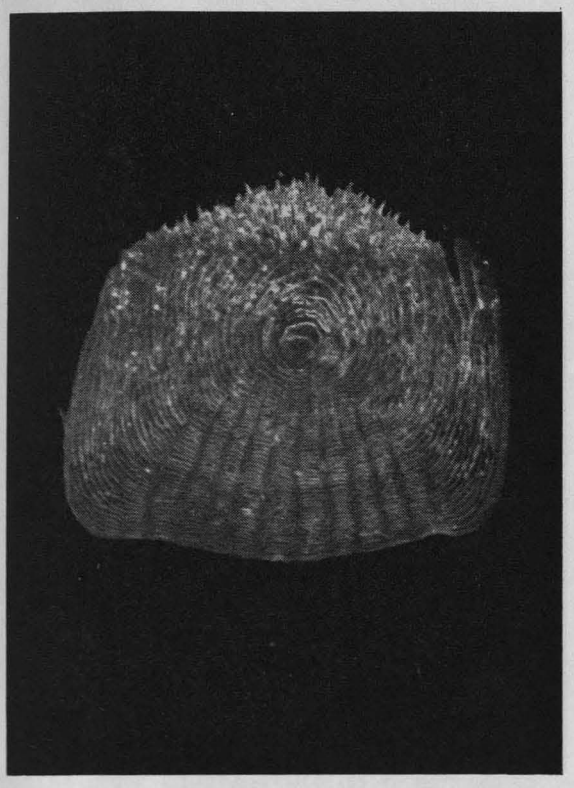

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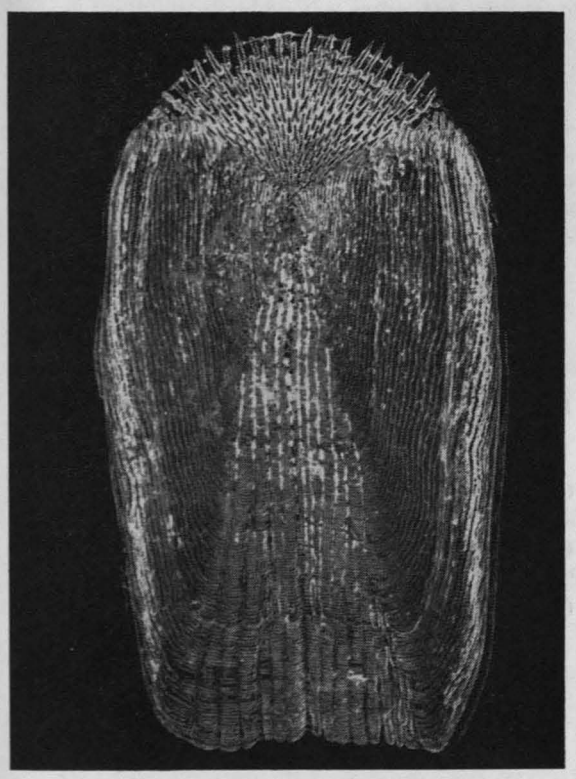
FIGURE THREE

b



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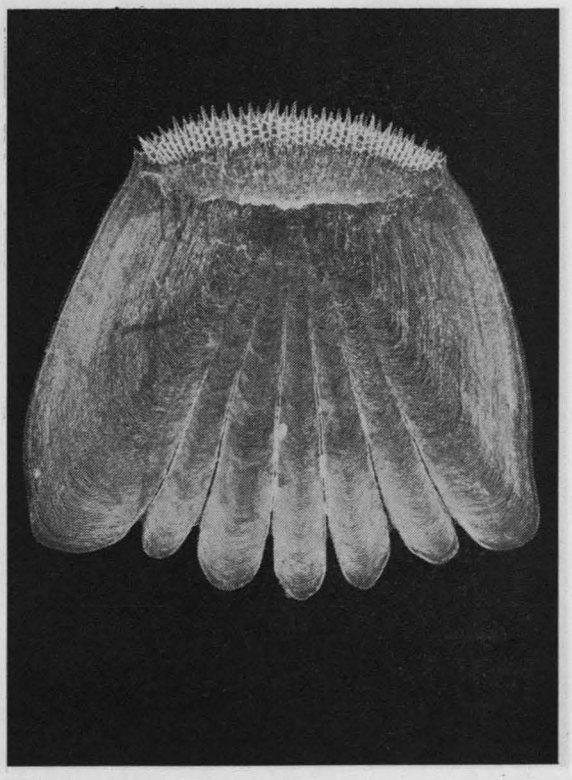

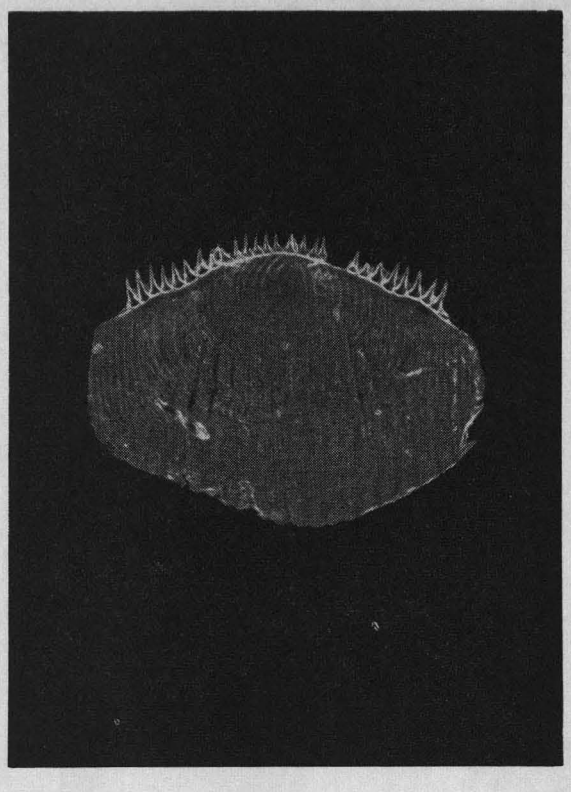

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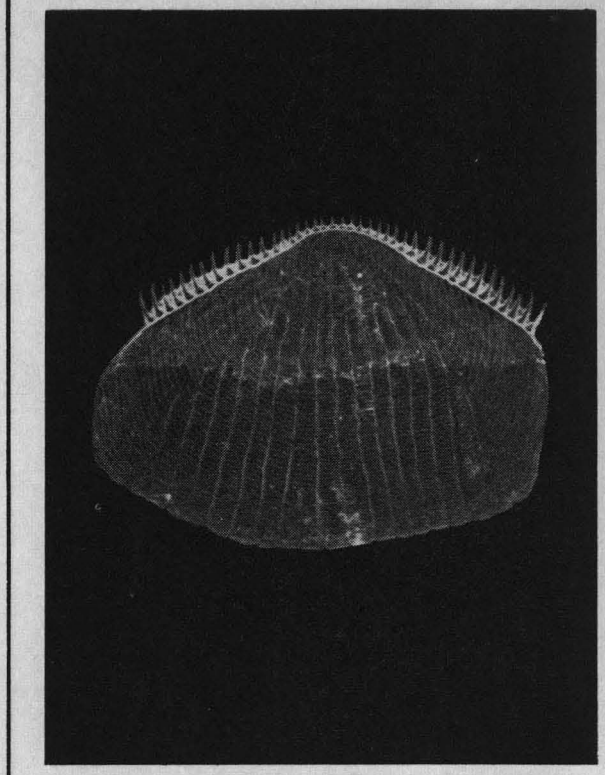

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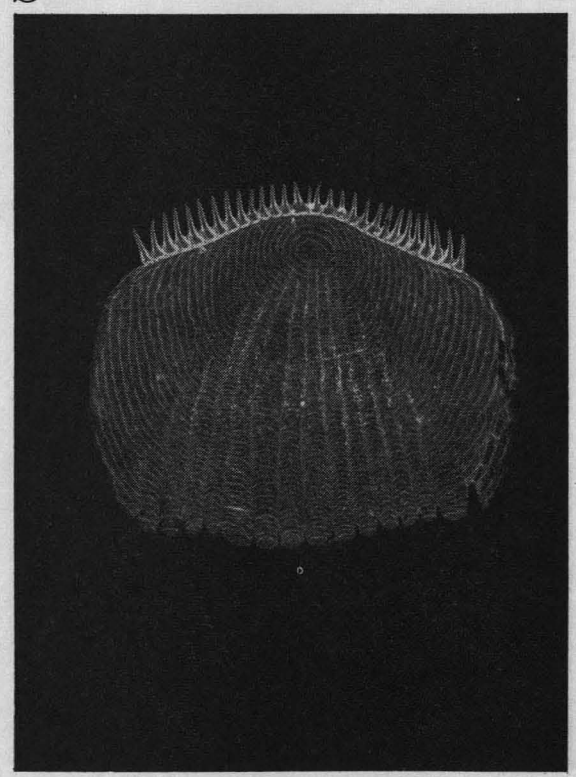
FIGURE FOUR



b

FIGURE FOUR

(*a*) *Western carp gudgeon, magnification x* 46.

(*b*) *Purple spotted gudgeon x* 33.

(*c*) *Flat-headed gudgeon x* 29.

FIGURE FIVE

(*a*) *Goldfish, magnification x* 17.

(*b*) *European carp x* 4.

Although this fish may grow to three-quarters of a pound and to 12 to 14 inches in length in N.S.W., their scales are extremely small for their size. The scale is oval in shape and elongated longitudinally in regard to the fish. The focus is offset towards the exposed margin and the lines of flexibility are broad, transparent and situated on the embedded portion of the scale.

Often cycloid scales have no line of demarcation dividing the embedded portion of the scale from the exposed portion and it is often difficult to establish which is which. However, the focus of the scale is generally offset towards the exposed edge of the scale. (Exceptions: European carp, see figure 5b; tench, figure 5c, and Australian smelt, 7a.) The only other structures associated with cycloid scales are the lines of flexibility which run radially from the focus of the scale.

The order CLUPEIFORMES is represented by three families in the inland, all of which have simple cycloid scales. The family CLUPEIDAE has only one member:

Bony bream (*Fluvialosa richardsoni*) (see figure 5d).

The scale is oval in shape and has one pronounced line of flexibility dividing the embedded section of the scale from the exposed portion. The circuli are extremely fine. The exposed margin of the scale is very slightly scalloped and the focus is offset towards the exposed section of the scale.

The family SALMONIDAE is represented by three species in the inland, all of which are introduced species and only occur occasionally here. The scales of these fish are cycloid and possess no lines of flexibility:

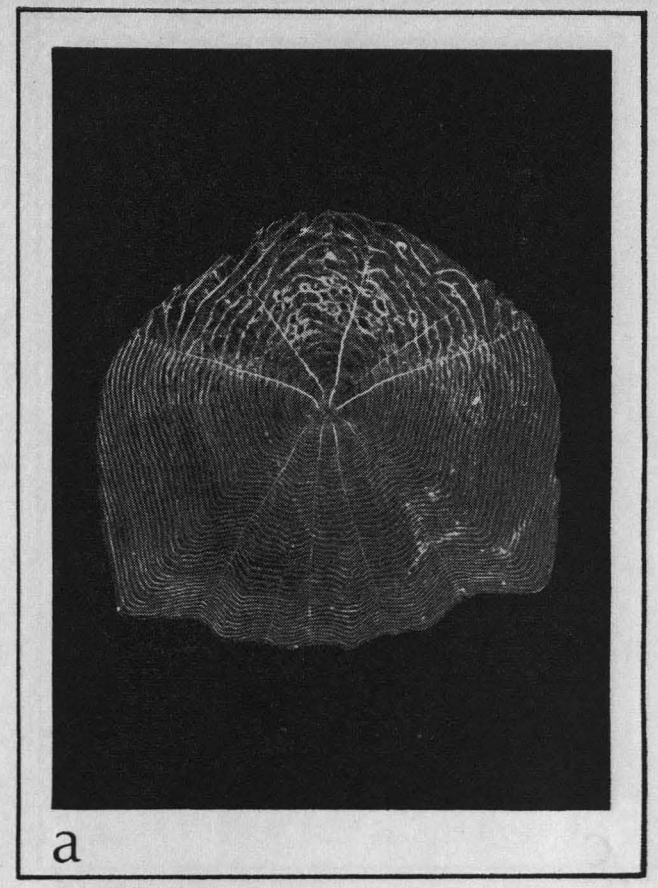
Rainbow trout (*Salmo gairdneri*) (see figure 6a).

The scales are oval in shape with the focus situated centrally. The circuli are discontinuous, particularly on the exposed section of the scale.

Brown trout (*Salmo trutta*) (see figure 6b).

The scales are round to oval in shape and their foci are offset towards the exposed section of the scale. The circuli are also discontinuous on the exposed section of the scale.

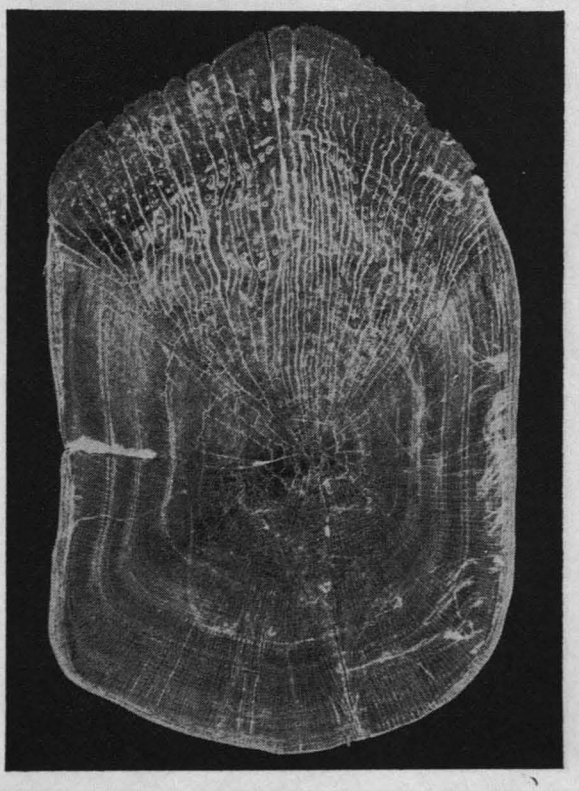
Atlantic salmon (*Salmo salar*) (see figure 6c).



a

FIGURE FIVE

b



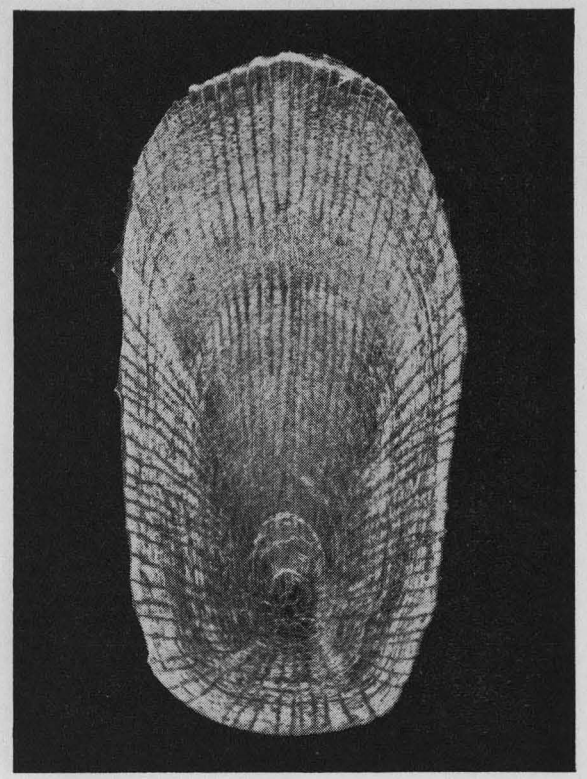


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FIGURE FIVE

d

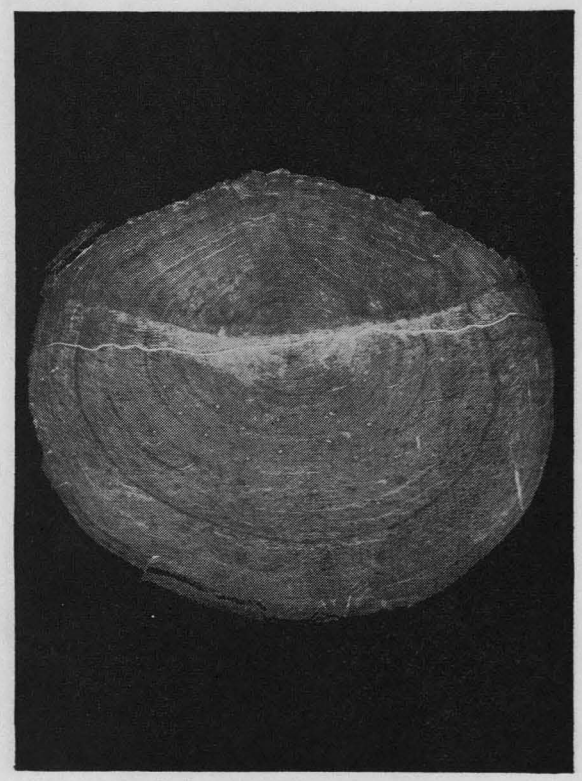


FIGURE FIVE—*continued*

(*c*) *Tench* x 15.

(*d*) *Bony bream* x 12.

The scales are oval in shape with the focus situated centrally. The circuli are more or less continuous around the entire scale.

Variations in structure of scale in these three species could give rise to difficulties in differentiating between them.

The family RETROPINNIDAE is another with only one representative in the inland—

Australian smelt (*Retropinna semoni*) (see figure 7e).

The scale is roughly oval in shape with an apex sometimes along the embedded margin. The centre is offset substantially towards the embedded edge and circuli are fine and few in number.

The order CYPRINIFORMES has two families:

The family PLOTOSIDAE in which only one species is represented—the freshwater catfish (Tandanus tandanus) which does not have scales.

The other, the family CYPRINIDAE is represented by four species in the inland, all of which are introduced fish. The scales of these are all cycloid:

Goldfish (*Carassius auratus*) (see figure 5a).

The scale is angular along its embedded end but rounded on its exposed end. Lines of flexibility run from the focus, which is situated nearly centrally to the embedded and exposed ends of the scale, but generally not to the sides. Circuli are fine and regular in the embedded section, but are spaced wider apart and more irregular in the exposed portion.

European carp (*Cyprinus carpio*) (see figure 5b).

The scale is rectangular in shape with a more marked apex on its exposed end which is slightly scalloped. The focus is situated a little towards

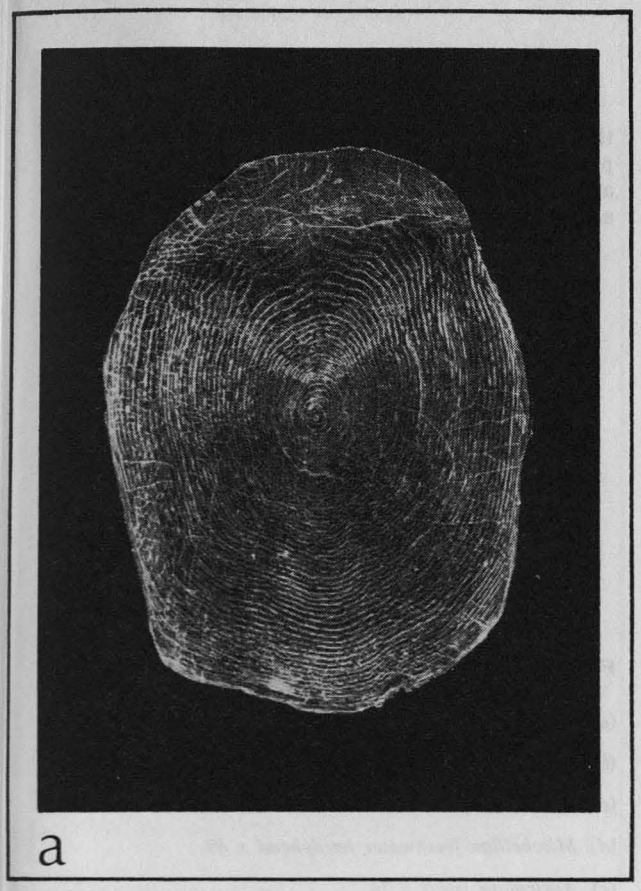
FIGURE SIX

(*a*) *Rainbow trout, magnification* x 17.

(*b*) *Brown trout* x 33.

(*c*) *Atlantic salmon* x 28.

(*d*) *Rainbow fish* x 33.



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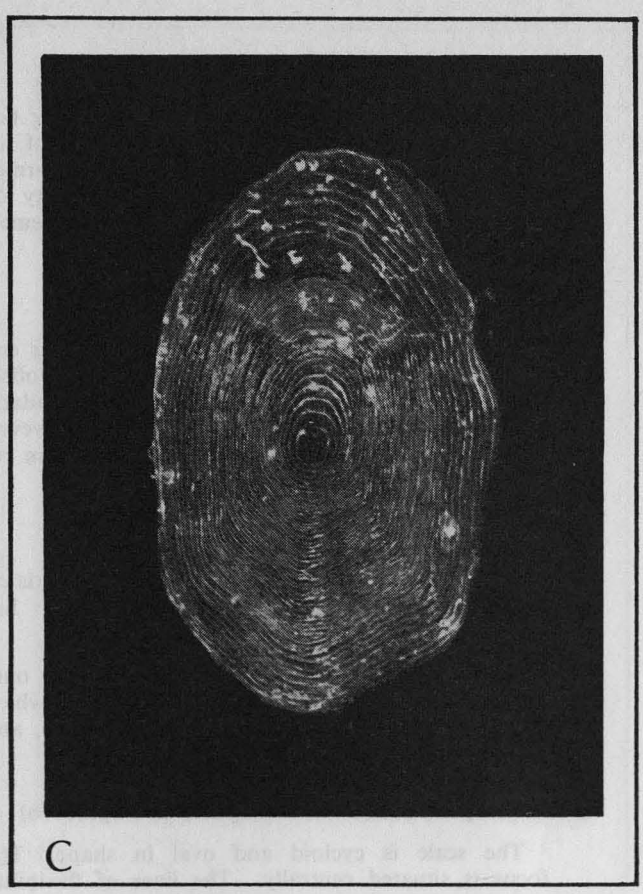

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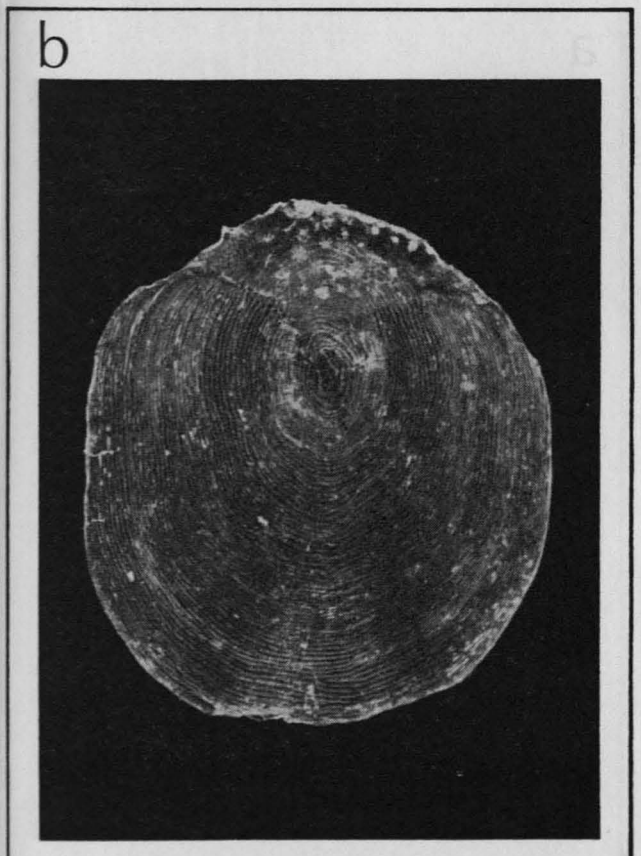
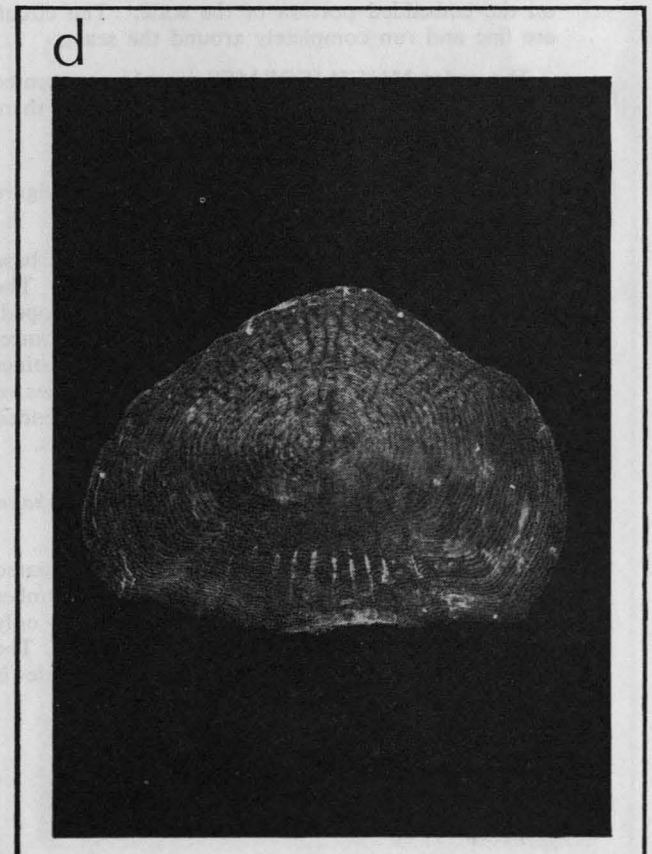
FIGURE SIX

b





d

the embedded end. The circuli are extremely fine and are nearly absent from the exposed end of the scale, where the lines of flexibility are well formed and quite pronounced. The lines of flexibility on the embedded portion of the scale are extremely fine.

Tench (*Tinca tinca*) (see figure 5c).

The scale is oval in shape with its embedder end slightly squarer. The focus is considerably offset towards the embedded end and circuli are particularly indistinct. The lines of flexibility are, however, well developed and radiate from the focus in all directions.

Crucian carp (*Carassius carassius*).

This species has not been positively differentiated from the goldfish in Australia, so no figure has been included.

The order CYPRINODONTIFORMES is only represented by one family, PEOCILIIDAE, which is represented by one species in inland waters, and this is an introduced fish:

Mosquito fish (*Gambusia affinis*) (see figure 7b)

The scale is cycloid and oval in shape. The focus is situated centrally. The lines of flexibility are broad and transparent, except where they terminate near the focus. These lines only occur on the embedded portion of the scale. The circuli are fine and run completely around the scale.

The order MUGILIFORMES is only represented by one family, ATHERINIDAE, in which there are two species occurring in the inland:

Rainbow fish (*Melanotaenia fluviatilis*) (see figure 6d).

The scale is semicircular in shape with the base being the embedded portion of the scale. The exposed margin of the scale is very slightly scalloped, with the surface rather mottled in appearance. Circuli are indistinct in this portion, but distinct in the embedded portion of the scale. The lines of flexibility are well developed on the embedded portion of the scale and radiate from the focus.

Mitchellian freshwater hardyhead (*Craterocephalus fluviatilis*) (see figure 7d).

The scale is oval in shape with its focus situated centrally. The circuli are fine and few in number and the lines of flexibility are fairly weak and only found on the embedded section of the scale. The margin of the embedded portion of the scale is weakly scalloped.

As can be seen by examining the figures, most of the scales here can be used to help identify fish, particularly if the fish are mutilated or unrecognizable as they often are when taken from the stomach of another fish.

FIGURE SEVEN

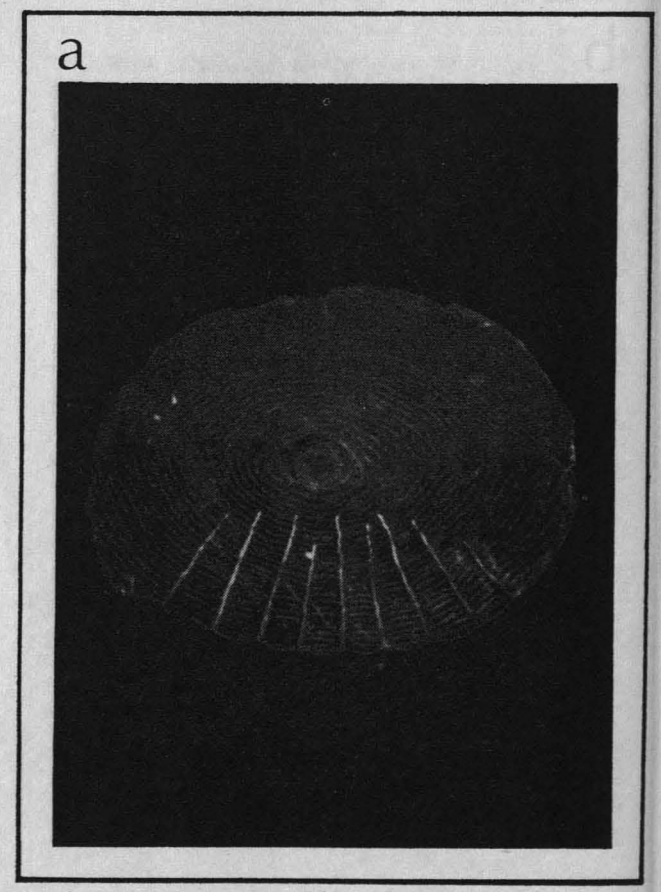
(*a*) *Western chanda perch, magnification x* 57.

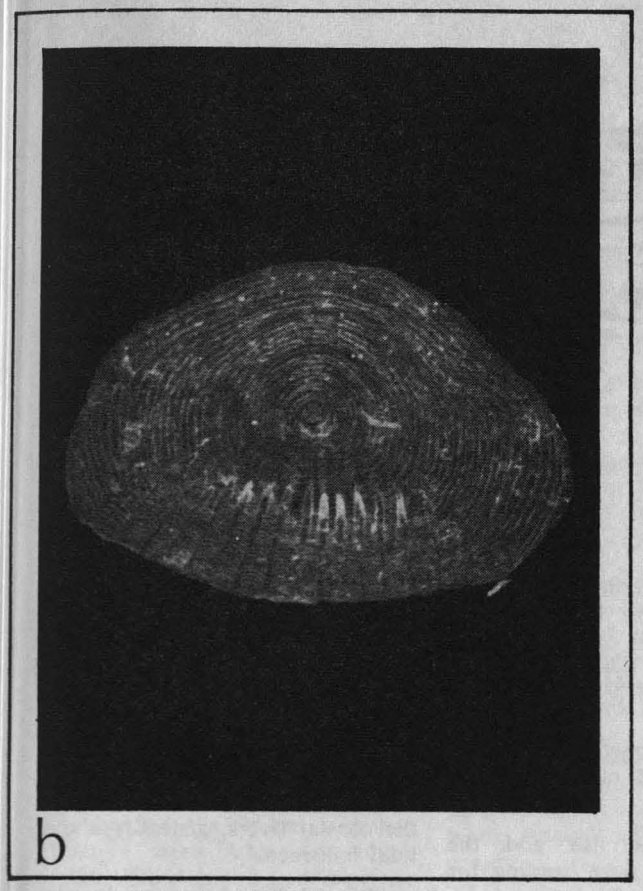
(*b*) *Mosquito fish x* 22.

(*c*) *River blackfish x* 36.

(*d*) *Mitchellian freshwater hardyhead x* 49.

(*e*) *Australian smelt x* 24.





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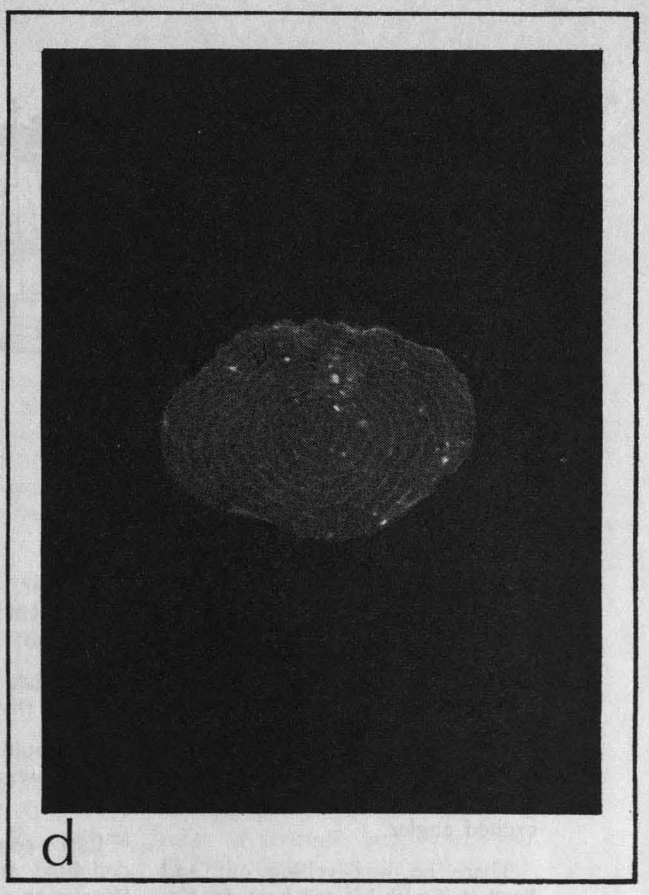

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FIGURE SEVEN

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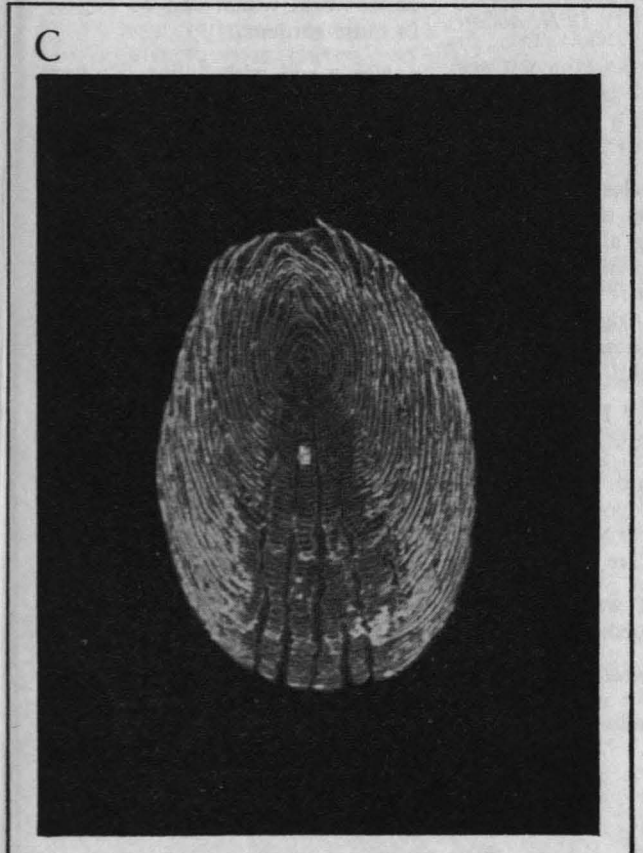

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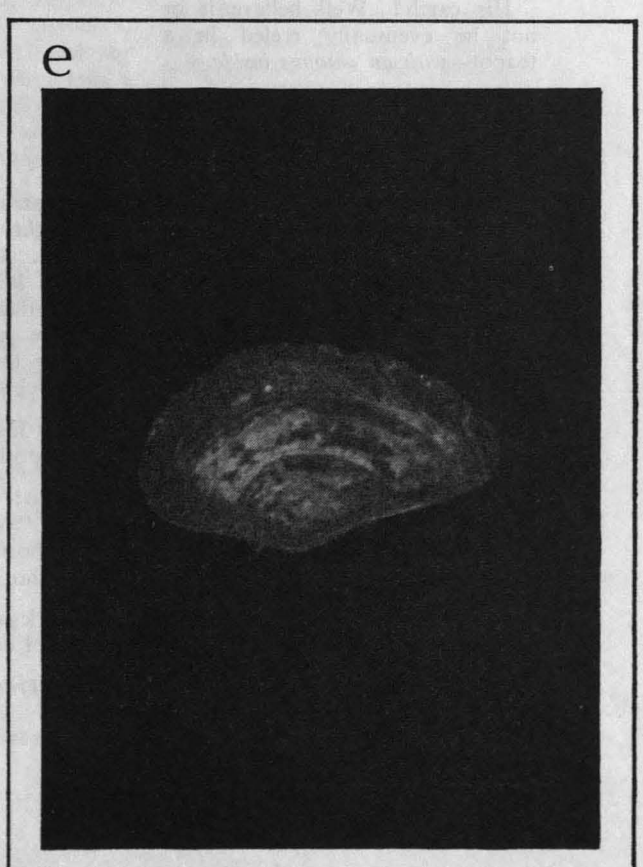
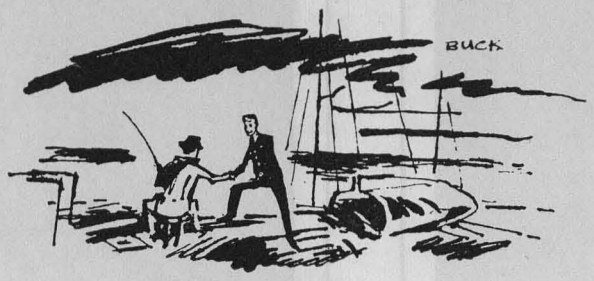


WHAT THE INSPECTOR SEES . . .



A FINE KETTLE OF FISH

The old baths is a favourite fishing spot at Tea Gardens and one day recently it proved to be exceptionally popular, for all around good catches of black fish were being taken.

But suddenly everyone's attention was diverted by a very excited angler.

There he was yelling out and hard at it with his rod bent double.

His catch? Well believe it or not he eventually reeled in a teapot—*with an octopus inside.*

The octopus had been well hooked, but had then apparently managed to make off for his (or her) teapot home nearby.

At any rate the angler proudly bore his trophy off.

From Inspector E. Boulton (Tea Gardens).

On 18th July, 1961, departmental officers released a quantity of golden perch (yellow-belly) into Burrinjuck Dam.

Little was seen of them for some time, but recently anglers have caught a good number which weighed between 2 and 3 lb, and at Burrinjuck Park on 3rd August this year, a veritable whopper was caught by Mr Pat Anderson, of Wagga.

The fish was 26½ in long and weighed (live) 16 lb.

It would be safe to assume that it was one of the original release.

Last seen the fish and the delighted angler were heading for Wagga at a rate of knots.

From Senior Inspector L. N. Abbott.

While patrolling closed waters one dark night I saw a boat with a net in it. Pulling alongside in the Fisheries launch I was greeted by a voice which said: "By hell mate you gave me a fright, I thought you were the inspector, but he has a powerful spotlight".

"Like this one," I said, holding up my spotlight and turning it on.

"Oh no!" he said. "Afraid so," I said. "Would you like to see my authority?" "No thanks, I know who you are," he replied.

The illegal net was seized and the patrol continued.

From Inspector H. J. Evans (Newcastle.)

It is often thought that bully mullet cannot be caught by the amateur fisherman on a line or rod, but this is not the case in the upper reaches of the coastal rivers of N.S.W.

During the summer months bully mullet can be caught on a rod or line in the fresh water areas of the coastal rivers, generally above tidal influence.

Although bread—or dough—can be used, the best bait is the common earth worm which can be dug up in most gardens.

Use a rod with a line of about 10 lb breaking strain, a No. I or 1/0 hook (using a float) and fish about 2 to 4 feet below the surface, according to the depth of the water.

You'll find that large bully mullet can often be caught and also the pink-eye mullet. These fish are good fighters and will give you fine sport.

The best time to fish for these species is during dry seasons when there is not much current running and when the holes in the rivers are likely to be full of mullet.

The fisherman should hold an Inland Angling Licence if he fishes for mullet in any of the coastal rivers above tidal influence along the coast of N.S.W.

From Senior Inspector H. W. Lane.

The Fisheries door bell rang sharply. On answering I was confronted by a young man all of four feet tall and about eight years old. He was holding the hand of a little girl (I later discovered she was his sister) and the two had an injured penguin with them.

"Mr Inspector can you help us?" said the young fellow. "I have a bird here that needs a a doctor. We found him on Cronulla Beach."

The unfortunate penguin had suffered extensive oil burns and was in a very distressed condition.

I told the boy to leave it with me and promised to do all I could to help it.

I'm not very adept at nursing, but I did what I could and was astounded when after a few days the bird recovered completely.

I liberated the animal and then about a week later my young freckled-faced friend and his sister returned to enquire after it.

They were delighted to find that I had been fortunate enough to save it and to hear that it was probably frolicking with its own kind that very minute.

They thanked me profusely and skipped off, obviously as pleased as punch.

From Senior Inspector T. J. Morrisey.

One morning in the early hours a number of vessels were observed unlawfully trawling in the Lane Cove River. The vessels were boarded, names taken and gear seized.

I remained on board one vessel which was in the charge of a juvenile. He was instructed to proceed to the Fisheries boatshed to unload his net and trawl boards, but as we left the closure he steered the boat to starboard instead of to port.

"This is not the way to the shed," I said. "I know," said the boy, but I want to pick up my father who is over there. He wouldn't come inside the closure."

Dawn was just breaking as we neared Compass Buoy, a high buoy at the mouth of the river, where I saw what appeared to be a giant black shag, but it turned out to be the lad's father, wearing a dark overcoat.

When he saw us he shouted to me: "My son is a cheeky boy, he saw the other boats going into the closure and insisted on going in too. That is why I am here."

When we reached him he gave his son a good wallop across the face. I don't know if it was for being disobedient—or for getting caught.

From Senior Inspector F. N. Bonser. We winced as we read Inspector Bonser's last couple of sentences, but still couldn't help wondering how the boy, albeit a cheeky boy, got a reluctant, big black shag of a dad out of the boat and on to the buoy before entering the closure.

This report was recently received from Gaden Hatchery, Jindabyne:

"On 1st August two female rainbow trout were netted in Jindabyne. They weighed 7 lb and 6 lb 6 oz respectively and in all were stripped of 14,500 eggs—which is not a bad effort."

The eggs will of course be fertilized and hatched at Gaden Hatchery.

It would be difficult for anyone not aquainted with the Murrumbidgee Irrigation Scheme to realize the added waterways it created and its importance to the fisheries of the area.

In 1906 the government of the day approved of the building of the Burrinjuck Dam and the Berembed Weir, which is situated on the 'bidgee about 25 miles east of Narrandera.

Work (during which the main canal was extended for about 100 miles from the 'bidgee through flat, waterless country beyond Griffith) commenced the following year. It was carried out by men weilding picks and shovels and with the use of horse-drawn scoops. Even by today's sophisticated standards it is considered a great feat of engineering.

The work went ahead quickly and by 13th July, 1912, the first irrigation waters flowed through the system. Today there are 1,335 miles of channels supplying water to farm lands from the main canal. It delivers a peak daily supply of 1,100 million gallons. Compare that figure with the 300 million gallons used daily in the Sydney metropolitan area and you will have an idea of the importance of the irrigation scheme.

And apart from the obvious commercial benefits, we anglers should be eternally grateful to the pioneers who had the foresight to envisage the scheme, because they gave us the opportunity to fish waters which would not otherwise have been available.

Most of the species common to the Murrumbidgee River are also to be found in the canal. No doubt you have heard stories about the large Murray cod caught there, but before you throw your gear into the car and dash off to try for one of these "big-uns", make sure that you have an Inland Angling Licence. You can obtain one at most sports stores or at the nearest court house.

From Senior Inspector K. Lee.

FISHING FOR FUN IN THE INLAND

This paragraph appeared in Ross Campbell's Column in the 19th July issue of "The Bulletin", under the heading:

"EELS GETTING LAST CHANCE

Eels in the Parramatta River are close to extinction, says a Sydney fisheries authority. In an effort to conserve the creatures, which are held in affectionate regard locally, they will be protected during the mating season."

LURKING IN THE LOCH?

The *Sunday Telegraph* reported that the Viper Fish, a $35,000 yellow submarine built in the United States, was used in yet another unsuccessful search for Nessie, the Loch Ness Monster.

During the search a film company, producing "The Private Life of Sherlock Holmes," was also at work in the loch, but the moviemen, presumably tired of waiting for the real monster to show up, created their own, which was towed by yet another submarine.

Close contact was maintained between the film crew and the hunters to make sure that the latter did not mistake the fake for the real monster too often.

What had Sherlock Holmes to do with Nessie? Don't ask us. As the Telegraph's correspondent pointed out, his creator, the late Sir Arthur Conan Doyle, died three years before the first sighting of the monster was reported.

Anyway, it all sounds like a lot of fun and in Scotland the monster is being described as "our greatest invisible asset". To date tens of thousands of dollars have been spent in attempts to find Nessie—mainly by Americans.

P.S. No further news of the progress of the party in the yellow submarine came in before we went to press, but as you know, yet another expedition party gathered at the loch in September.

It was organized by the Loch Ness Phenomena Investigation Bureau Limited and gained momentum following the report of the finding of a "monstrous 4 ft 2 in long and 2 ft 7 in across knuckle end."

The great bone, which was not fossilized is believed to be the remains of either Nessie or one of her kind. It was found near the loch last May by two English anglers. At first they thought it was a log, but after sitting on it, discovered it to be a bone—and for some reason hid it.

However, upon hearing of this latest expedition, they contacted the organizers and agreed to reveal the hiding place, subject to their identity being kept secret.

Goodness knows what next.

SUPERTROUT

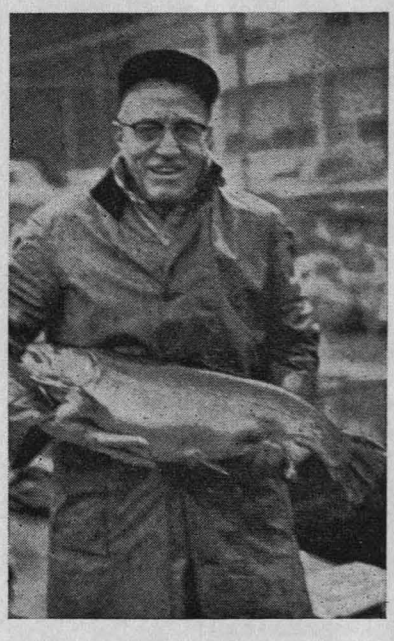
Dr Lauren Donaldson, of hte University of Washington College of Fisheries, is developing "Supertrout".

He was pictured in an advertisement (placed by the State of Washington) in a recent issue of *Scientific American* holding a 2-year-old trout which weighed 18 lb (six times the norm) and it hadn't stopped growing.

The story was unfolded in the ad:

"In the back of the University fisheries lab a high fence encloses eight pools of fingerling Supertrout. The new breed is a hybridization of the migrating Steelhead and the fast-maturing, stay-at-home Rainbow. In crossing the two closely related species, the rapid growth characteristic of the specially selected Rainbow is dominant.

Dr Donaldson with his 2-year old supertrout weighing 18 pounds.



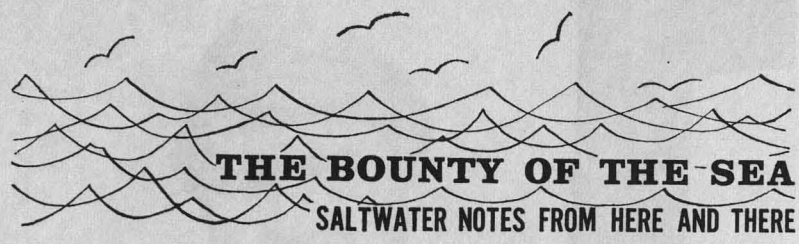
"The Supertrout become sexually mature in two years instead of the usual four, and at that age are three times larger than a mature 4-year-old Steelhead.

"The University's fish ranch borders on Portage Bay, a fresh water lake in Seattle, which connects by way of ship canals and locks with Puget Sound. To insure selection of only the hardiest trout, the lake water is channeled into the breeding ponds without benefit of any purification, aeration or temperature control. The fingerlings who don't make the grade are ground up for plant fertilizer. The ones who do are fed a special fish autosylate (pre-digested hake) for six months to build up their mineral balance, and are released into the lake to make their way down the ship canal and through the government locks to salt water. When they return to spawn after their abbreviated maturation, the fisheries staff laboriously sift through half a million fish to select a blue ribbon two hundred for further breeding purposes.

"Donaldson's meticulous selective breeding has produced a strapping animal which resists pollution and disease, migrates earlier than normal, matures younger, has a higher survival rate, produces ten times as many eggs, and, according to certain faculty members, tastes better.

"The University's research with the Supertrout and migratory Chinook salmon has profound implications both for the fishing industry and the food supply of the human race. Bred in the artificial environment of the laboratory ponds, the fish make their way to the nearby open seas to mature. Two years later, directed by their infallable homing instinct, the giant hybrids gallantly present themselves to those same ponds for harvesting.

"What could be more convenient?"



THE BOUNTY OF THE SEA

SALTWATER NOTES FROM HERE AND THERE

NEW SAFETY JACKETS, designed to keep fishermen afloat if they are swept off rocks or overboard were exhibited at the recent Sydney Boat Show and are readily available.

They are light, water and wind proofed and if it proves necessary, easy to swim in.

If you can't swim, we reiterate—their main claim to fame is that they were designed to keep the wearer afloat.

FISH-IN CAUSES FREAK OUT

NATO and the British Ministry of Defence were "extremely annoyed" recently by the actions of a fisherman known as Shellfish Sam.

Sam was having some success fishing from a small boat for queenies (a type of shellfish) at a spot about 5 miles off the coast of the Isle of Man—the very area where bombs were scheduled to be dropped during a NATO exercise.

But for 3 weeks Sam refused to stay clear of the area and thousands of dollars worth of fuel was wasted when jet pilots had to return to base in Germany without completing the vital part of the mission.

At last report an RAF officer from NATO was en route to negotiate with Sam, who commented "I have my living to think of".

FREEDOM

A CONTRIBUTION FROM A YOUNG READER,
MASTER JOHN SAUTELLE

With a graceful curve they wing through the air,
free from the worries and strains which we bear.

Oh if only I could be like them, I'd swoop and soar
never to return again.

I'd escape the chains of this earth-like hell
which man has created and ruined as well.

He has polluted the air, and caused untold strife,
for man has upset nature, the web of life.

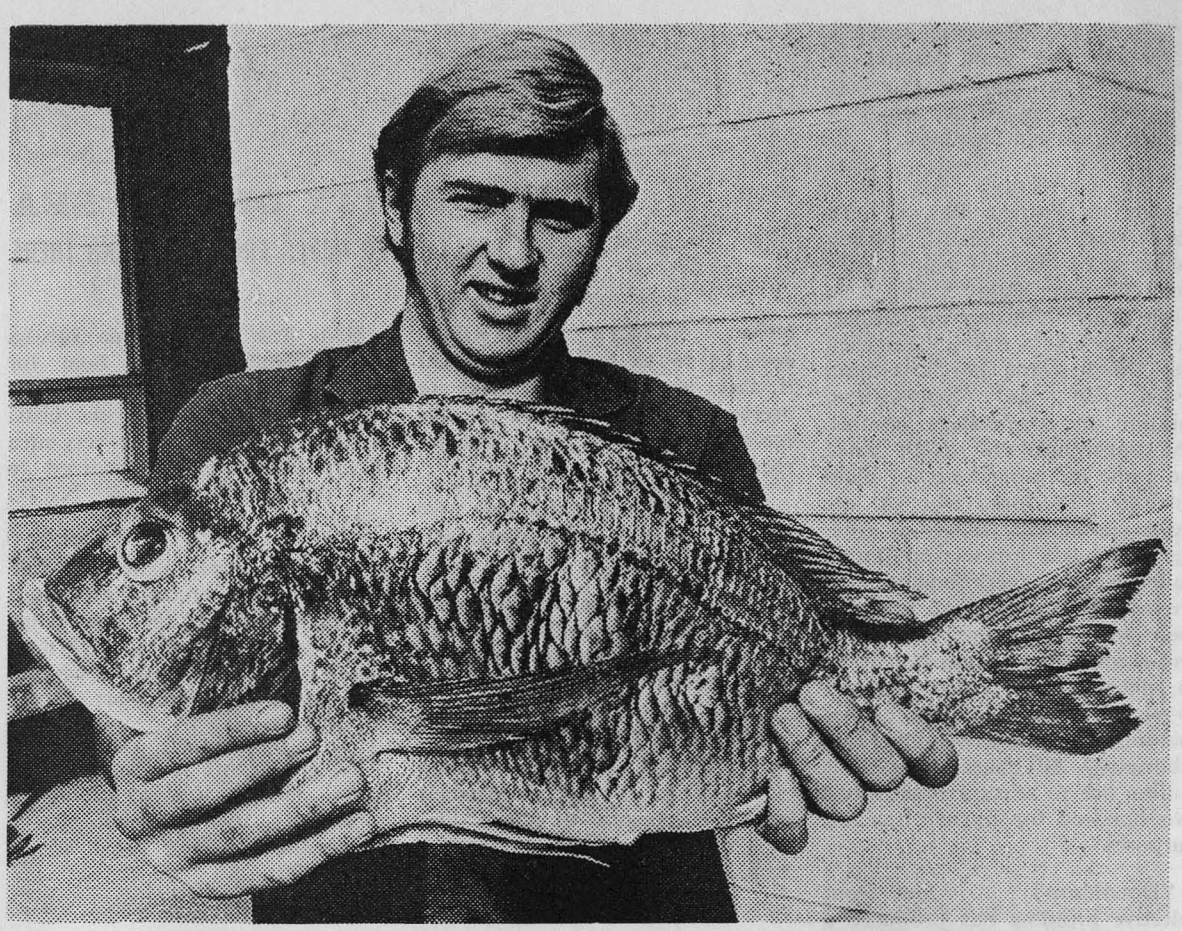
But in the near future, man's follies will be felt,
when the next generation can't live where their forefathers dwelt.

Because of man's stupidity, and lack of forethought
he may lose this land he so dearly bought.

But if man acts now, and he acts well,
then once again this world may be for him to dwell.

And then like the birds, he could dive through the air,
with hardly a thought and nary a care.

WHAT WILL MAN DO?



BLOCK COURTESY "DAILY TELEGRAPH".

Speared with home made gun

MR MICHAEL BRAY, of Peakhurst, with the 8 lb 1 oz black bream he caught near Shark Island in Sydney Harbour on 11th July.

He speared the fish, which was 23 in long and had a girth of 20 in, in 2 feet of water using a home-made, rubber powered gun.

Mr Bray hopes that his catch will be ratified as a world record. Previously the record weight for a speared black bream was $5\frac{1}{2}$ lb, while the certified world record for a rod caught black bream is 8 lb 4 oz. That fish was caught on a 10 lb breaking strain line by Mr Noel Beckhouse at Swansea in December, 1967.

FIELD STAFF AT A GLANCE

Fisheries officers are ready and willing to help anglers with any fishing problem. This guide shows where to get in touch with the nearest inspector in your area.

Chief Inspector: J. I. Williams 20529 extn 352, private 529 8316
Deputy Chief Inspector: F. C. Atkins 20529 extn 361, private 521 1802
Supervising Inspector (Inland): A. F. Arentz 20529 extn 369
Sydney Fish Market Inspector: R. W. Budd 660 2693
Liaison Officer—Oyster Farming: H. Croft 20529 extn 385, private 528 6040
Head Office Inspector: G. L. Williams 20529 extn 361

Zone and Senior Inspector	*District*	*Inspector*	*Address*	*Telephone*
		COASTAL		
MACLEAN				
C. Whittaker	Tweed Heads	R. Burrows	Tweed Heads	Tweed Heads 241
	Ballina	W. Brinsley	Ballina	Ballina 86 2018
	Maclean	C. Whittaker	Maclean	Maclean 452147
TAREE				
K. Pryor	Nambucca Heads	B. MacKenzie	Nambucca Heads	Nambucca Heads 131
	Port Macquarie	R. Amor	Port Macquarie	Port Macquarie 831102
	Taree	K. Pryor	Taree	Taree 374
TUNCURRY				
H. Lane	Tuncurry	H. Lane	Tuncurry	Forster 76
	Karuah	L. Bouchier	Karuah	Karuah 13
	Tea Gardens	E. Boulton	Tea Gardens	Tea Gardens 214
NEWCASTLE				
H. Evans	Newcastle	H. Evans J. Irvine G. Dimmock	Wharf Road, Newcastle	Newcastle 23801
	Swansea	A. Townsend	Lambton Parade, Swansea	Swansea 201
	Toronto	S. Robinson		
	Toukley	C. Noakes		
SYDNEY METROPOLITAN				
F. Bonser	The Entrance	F. Brown	The Entrance	The Entrance 322147
	Woy Woy	R. Sharrock	Woy Woy	Woy Woy 411157
	Brooklyn	R. Cook	Brooklyn	Brooklyn 611-1256
	Sydney	F. Bonser G. Bennett R. Jones	12 Shirley Street, Wollstonecraft	43 5046
METROPOLITAN SOUTH				
T. Morrisey	South Metropolitan	T. Morrisey	Nicholson Parade, Cronulla	523 5911
		N. Fowler B. Smith	Riverside Drive, Sans Souci	529 6021
	Lake Illawarra	A. Stein A. Dean	Lake Illawarra	Wollongong 951809
	Nowra	J. Triffitt	145 Shoalhaven Street, Nowra	Nowra 22740
BATEMAN'S BAY				
N. Hopkins	Bateman's Bay	N. Hopkins A. Schofield	P.O. Box 17, Bateman's Bay	Bateman's Bay 724032
	Narooma	R. Thompson	Narooma	Narooma 72
	Merimbula	A. Stanborough	P.O. Box 30, Merimbula	Merimbula 51527
		INLAND		
NARRANDERA				
K. Lee	Balranald	R. Mills	P.O. Box 94, Balranald	Balranald 270
	Buronga	A. Mustard	P.O. Box 66, Buronga	Mildura 31869
	Deniliquin	A. Storm	49 Butler Street, Deniliquin	Deniliquin 973
	Condobolin	W. McConville	160 Bathurst Street, Condobolin	Condobolin 555
	Narrandera	K. Lee	c/- Inland Fisheries Research Station, Narrandera.	Narrandera 393
	Menindee	R. Bingham	c/- P.O., Menindee	Menindee 129
YASS				
L. Abbott	Yass	L. Abbott	Lot 1, Waroo Street, Yass	Yass 261772
	Albury	W. Delaney	896 Mate Street, North Albury	Albury 211766 extn 25
	Snowy Mountains	K. Douglas	37 Bligh Street, Cooma	Cooma 22620
	Jindabyne	K. Byles	c/- Gaden Trout Hatchery	Jindabyne 335
NOT ZONED	Manilla	H. Pincott	c/- P.O., Manilla	Manilla 82
	Bourke	E. Gray	c/- P.O. Box 236, Bourke	Bourke 22481
	Bathurst	T. Blackman	65 Gorman's Hill Road, Bathurst	Bathurst 31 1113

Fisheries Inspectors Act as Boating Examiners

Seven inland fisheries inspectors have been appointed examiners for drivers' licences under the Maritime Services Board's boating regulations.

They are: Hugh Pincott (Manilla), Alec Mustard (Buronga), Stan Robinson (Menindee Lakes), Alan Storm (Deniliquin), Jerry Abbott (Condobolin), K. Douglas (Bathurst), and E. Alan Gray (Bourke).

The inspectors will examine candidates who intend driving water craft under 65 feet long at a speed of more than 10 knots. The oral examination deals with the regulations applicable to registration, safe navigation, general boating practices, and the rules of the road on waterways.

An eyesight test is necessary but can be waived if a current car licence is produced. Minimum age for a licence holder is 17. Licence cost is $3 and subsequent renewals $2.

Boats under 65 feet long and capable of more than 10 knots must be registered by the Maritime Services Board.

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